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THE PSYCHOLOGICAL REVIEW

AGE AND HUMAN ABILITY[1]

BY WALTER R. MILES
Yale University

Forty years have passed since Cattell, Hall, Jastrow, James, and other illustrious early leaders of psychology in America founded this Association. The organizing of a scientific society is a task that may easily be delayed or botched. Fortunately for us neither occurred. The American Psychological Association seems to have been started in the most admirable scientific spirit and at the right time. Its first gathering followed promptly the wave of scientific-educational interest that in the previous year or two had resulted in the establishment of psychological laboratories in twelve or more American universities and colleges and in the calling from across the Atlantic of Münsterberg to Harvard and of Titchener to the great University at which we are met.

All of us have been benefited professionally in many known and perhaps also in as many unknown ways by the early and enthusiastic initiative of our founders. They did not dally, they did not quarrel. They believed in the future of psychology and coöperatively launched the ship on a strong tide which has carried them and us surely and swiftly over many possible obstructions. The high place of our science in America today and of American psychology in the world at large is in great part creditable to these men, and to their foresight and energy in making use of their opportunities.

[1] Presidential address delivered before the American Psychological Association at Ithaca, September 9, 1932.

I think it would have been very unfortunate if through delay in organization different subgroups of psychologists, for example, educational, comparative, social, abnormal, or those interested in statistical methods, had become enamored of the idea of forming separate national societies. As it is, we have flocked together and have flourished. The original membership of 31 has become something over 1600. There were 12 communications at the meeting of 1892, whereas our program committee in the current year has accepted 118 titles divided into 17 sessions. Some of our members have gently hinted from time to time that our association is now too large and heterogeneous and that the programs have grown out of all reasonable bounds. I grant that one eats most comfortably day by day at a table set for two, but it seems equally obvious that most people can have a superb time now and then at a great festival banquet even though the attempt to select the best *hors d'oeuvres* and the most satisfying *entrées* may provoke mental perplexity. I shall not presume to say how long or how large our Association can grow; the future must have its own developments. Not prophecy about the society but warm praise and high honor to the men who fathered it should characterize our present gathering. At this, the fortieth anniversary of our founding we are honored by the presence of Cattell and Jastrow, and we can also number Frank Angell, Baldwin, Burnham, Delabarre, Scripture, Witmer, Patrick, and Dewey, in the active ranks. I believe it is our unanimous desire to express in no uncertain words the indebtedness that we feel to these men for their large understanding of the needs of psychologists and their activity in coordinating the interests of the profession. The founders of this Association held psychology together, uniting in one group all who were willing to work on materials and problems thought and imagined to be psychological. They set the course and pushed forward, making their object "the advancement of psychology as a science." Into this advance they put their very life's energy, using their own time and private resources to promote research and to secure the publication of discovered facts. They labored for the founding of special chairs, the establish-

ment of departments and the development of laboratories and research agencies in colleges, universities, and individual institutions throughout the country. Ours is the engrossing responsibility and the ringing challenge to carry on in ways befitting this early faith and leadership.

I think there is no need that this occasion should be used in detailing the history of our Association, for, thanks to Professor Fernberger, we have recently been favored with a full and ably prepared account of its growth and progress (**8**). The extent to which 'the advancement of psychology as a science' has been thus far realized by our society is an attractive if hazardous subject that had best be left to a later anniversary, when a half century at least, or perhaps even a whole century shall have passed. Although it would not be inappropriate on this occasion to use again the title that Hall used for his presidential address at our first meeting, "The History and Prospects of Experimental Psychology in America," I have chosen to discuss this evening a rather more concrete topic. It is comprehensive because within it each of us lives, moves, and has his being. It is the influence of age on human ability.

Need for a Psychology of Maturity

Psychologists have exhibited great interest in the first two or two and a half decades of life. In so far as human behavior has been carefully measured and check-measured, attention has usually been directed to this segment of positive development. Infants, children, adolescents, and young adults have been examined by the manifold techniques, tests, and intensive experiments at our command wherever these could be applied to children and youngsters who by reason of educational or other social grouping have been under our jurisdiction. Abundant fruit has been harvested from this field and bright prospects loom before the current and projected studies of the embryo-to-adult period.

Important as this work has been and now is, still it leaves five or six decades of human adult life relatively untouched. Maturity, later maturity, and senescence are still the realm for folklore, anecdote, and personal impression. With a

think-as-you-please psychology holding sway clear across the span of man's maturity we are not in an advantageous position to contribute importantly to the social, economic, and cultural concerns of life, even when, as at present, the world in a critical period cries for aid from psychology. It is generally agreed that psychology has given large assistance in the field of human education even to the extent of remodeling many of its aims as well as its techniques. This advancement has been the result of long and careful study of human childhood and youth. What practical results may follow from equally extensive and prolonged scientific investigation of the psychology of adulthood and maturity, it is I think quite too early to predict. It is upon the filling in with certain definite topographical features of this uncharted area in the psychological map of our human existence that I would like just now to focus your attention.

The Necessary Association of Life with Age

Life and time mask each other. When one is in our view it seems for the moment alone and independent of its fellow mate. A tree because it lasts so long scarcely appears to live; a man because he acts so vigorously and so variously scarcely seems susceptible of temporal change. Indeed human existence from the inside, subjective view appears to the mature individual to be free of time and its confining limits. But let us take a look at these relations through an imaginary time-condensing glass.

A certain giant redwood of California has often been popularly featured as 'the oldest living thing.' It is surely one of the quietest of living things. But if we could view the complete course of growth, the life span of this redwood tree, in a faithful cinematic reproduction that would require only two minutes to project, if we could see as a continuum the stretching and swaying of the trunk, the furrowing of the bark, and the unfolding and reaching of the branches, the perceptual condensing of time would make extremely evident the active, vigorous, almost animate life of the great plant. Again it is difficult to imagine the impression to be derived

from a motion picture film similarly portraying the growth and life course of a human being. The content of our existence is so predominantly movement from place to place and specific behavior in response to changes in environment that if we should see pure time change, condensed and happening progressively in one continuous sweep throughout life with environment and posture constant (9), the effect would be nothing less than startling, perhaps even horrifying.

Individual mental life seems in some way to transcend or to minimize time. Mind feels itself unbound by it, although clearly recognizing before and after with reference to particular mental events. It is easy for us to have a general sense of immortality. Perhaps this results from the relative excellence of human memory and our ability more or less clearly to imagine ourselves in future days and other places. To this is added the strong tendency definitely to experience ourselves as objects among other and seemingly very permanent objects. It is difficult for the mind that perceives to think of this sheet of paper as being organized in such a way that it can last longer than itself. Accordingly time occupies a secondary place in our apprehension of life. We have regarded it as a separate or extra entity that need not actually be present in the more important scenes in our drama of existence.

Modern physics seems bent on setting us right and dispelling the world-old illusion of common sense that time is a mischievous intruder. Current theory recognizes only one physical reality in the universe and that is space-time. According to this view time is integral and basic in the ultimate constitution of everything, inorganic or organic, and each smallest bit or mightiest mass of the stuff of the world contains time as an indissoluble characteristic. Space and matter have disappeared as concepts of the final simplification of things and have been replaced in our theories by various configurations of space-time, which differ from one another not in the material of which they are composed but rather by reason of the principles of their organization. Each of these configurations acts or tends to act as a whole, not in parts

nor as a sum of these parts and this unity-action principle provides the appearance of difference and of multiplicity of form which we perceive. The texture of the world is made up of events, not physical materials.

This theory appears to fit biological and psychological life-outlines rather well and if it can also be justly applied to that which we have called inanimate it seems even more attractive. What we all want is to find and to feel sure of the reality of an essential unity in our universe. Space, time, matter, life, mind:—there is one of these for each of man's fingers. In our earlier thought attention was concentrated on the independent mobility of the five separate digits. Now we are beginning to see the fundamental unity and inter-relationship that makes possible the grasp and carrying capacity of the whole hand. Mind does not stand alone nor is life its only correlate. Perception, memory, feeling and creative imagination, in fact all that we are or can do depends on an indescribably intimate relation between mind and the environmental universe. In every cell and functional event of our beings, in every modality or so-called mental ability that our behavior seems to demonstrate, time in the form of irreversable process is an essential constituent. We have come to recognize and to accept the close connection between time and behavior in young life. But when in maturity we cannot see our behavior pleasantly flavored with the process which we call development, we become shy of time's presence and prejudiced against it. It seems to me that psychology today must overcome this shyness and push beyond the period of childhood into the comparatively unexplored region of maturity, arranging comprehensive studies covering man's psychological progress in the last two thirds or three quarters of the full time range. Life-age is the entity or phenomenon before us for study; for life is dependent on age, in fact, it is age.

Clinical and educational psychologists have adopted a scheme of measurement units such that mental as well as chronological age can be expressed in comparable terms from infancy to young adulthood. Geneticists talk of develop-

mental age. Personality psychologists classify attitudes, interests, and emotional traits on an age basis as infantile, youthful, or mature. Events, and tendencies in the mental experience of individuals are thus coming to be viewed and valued by the various psychological specialties in terms of life-age.

Psychology shows special vigor at the points where the time and age aspects of mental behavior are held in the foreground of research interest. We all see that the broad concepts which delimit the total psychological realm—'life,' 'mind,' 'mental experience,' 'consciousness'—unless approached in terms of the concrete phenomena in which they are expressed, present abstractions so remote and even artificial as practically to switch us from the solid experimental track that runs near the biological-physical world. The acceptance of evolution did not abolish the self-assigned seclusion of psychology from the rest of natural science. Behaviorism and comparative psychology had to come as efforts to bring our experimentation into levels definitely connected with the already plotted regions of the earlier natural sciences. I have no wish that these remarks should be interpreted as an effort to create a new *ism;* nor do I envisage 'gerontology' as a field that differs essentially from others that make up equally with it the materials for the study of human experience. I am not trying to repeat Osler's joke (**6**) or Dorland's rejoinder (**7**). I am here simply casting my vote in favor of turning our experimental searchlight clear across the length as well as the breadth of man's life-span. I am advocating extensive survey of all the psychological space-time at our disposal and of making all along the line the same kind of intensive studies that have already been made and are continuing to give valuable returns at certain attractive spots.

Life–Age Samples

Granted that adequate study of the phenomena of behavior throughout the entire life period is essentially important for a complete human psychology, we are at once faced with the very concrete question of how to proceed in

the matter of investigating the psychology of maturity, later maturity, and senescence so that the results may form a continuous series when placed end to end with the findings in the periods of childhood and youth. Undoubtedly there are many ways and scores of places from which to take off. Need I say to fellow psychologists that numerous important beginnings have already been made although they were in many cases not thought of by the investigators who made them as parts of a genetic psychology of adulthood. Essays on old age and on the prolongation of active life from those of Cicero (3) and Cornaro (5) to that great compilation and critique on senescence by Stanley Hall (10) are filled with case reports giving hints and suggestions for systematic procedure —a rich historical background for contemporary and future work. On the experimental side we have the invaluable array of army data secured by Yerkes (31) and his collaborators. There are also the well-planned studies of Jones (12), Conrad (4) and their associates, Willoughby's (30) work on family resemblance, Ruger and Stoessiger (23) on muscular strength, Tachibana (27) on practice effect and physical strenth, Nicholson (20) on tapping, Kitson (13) on typewriting, Ballard (1) on solving puzzles, Platonoff (22) on capacity for concentration, Peterson (21) on reasoning and memory, Hollingworth (11) on intelligence, and Werner (29) applying a variety of tests to a small group of people 63 to 83 years of age. Certain animal studies are also pertinent, notably the series directed by Calvin Stone (24). The work of Thorndike, Bregman, Tilton and Woodyard (28) on human adult learning up to the age of 50 or 60 has tremendous scientific as well as practical value. I think all of these researches give testimony to the importance of investigations in which age is a well-controlled variable.

The men cited and other investigators of mental behavior in human maturity find in the problems of population and sampling almost forbidding technical difficulties. Subjects for research in so far as they represent the population at large are not available in the compact and responsive groups that school and college classes provide. Doubtless this is in fact

the chief reason why we regard adequate selection of adult subjects as treacherous, and why we have not already exploited the later life periods by psychological measurements. A canvass of adult social groups has however revealed a natural and practical source of subject material, less easily accessible than the educational groups of young people, it is true, but nevertheless sufficiently approachable and cooperative. The spontaneous adult social clusters in existing popular organizations tend to be of homogeneous character, that is, each is made up in general from a single social stratum and with its focus in a given educational level. Infrequently does a single group of this character tend to be a cross-section of the whole population of a city or district. Clubs, and lodges, fraternal, social, and philanthropic organizations are, however among the types of groupings from which a representative test population can be built up. The investigator of human maturity has to secure the confidence and interest of a suitable selection of these already formed clusters chosen in terms of the human material each can furnish, so that the aggregate will offer in miniature the same psychological picture as the given larger population under scrutiny with its several socio-educational levels properly represented. Investigators have generally found that outside of special educational groups the cooperation of adult subjects as individuals is most difficult to secure. But the method of enlisting group cooperation through the help of existing clubs, societies, and other social clusters has proved very effective. By rewarding the organization, not the individual, we avail ourselves, for purposes of motivation in the experiment, of the loyalty and the spirit of service that the individual feels toward his own group. For the duration of the experimental period the scientific pursuit then becomes in the mind of the subject a part of the club activity and so it enjoys positive and enthusiastic support. This natural psychosocial set-up offers far-reaching possibilities for comprehensive behavior research and gives us a means for controlling population and sampling in terms of the criteria that we may wish to apply in a given experiment.

Research interest on the part of non-academic adults is,

of course, not inexhaustible. Most people are willing to serve once as subjects in a psychological experiment if properly approached through an enthusiastic member of their own club, if the appointed time and place are not inconvenient, and, what is even more important if it seems clear to them that there is nothing personal or invidious in the invitation to participate. "Just why was I selected for this?" is a question very frequently asked. Perhaps the best reply emphasizes the important need for representative sampling, and this is one that appeals to the reason of the individual adult who also interprets the adjective in a personally favorable sense.

Not all adults who willingly serve a single time as subjects care to volunteer for a second session and fewer still for a third or fourth. Therefore the value of the first period of experimentation is critical. If the test program is diversified, if the surroundings are interesting and attractive, and if the experimenters are friendly and agreeable two hours maximum for this single experimental period can be regularly reached. This comparatively short time and the danger even within it of waning interest force the researcher to a careful consideration on the one hand of the significance and importance of the types of measurements used, on the other of their technical applicability, fitness in terms of score range, and relative efficiency in terms of the testing time required. It is unnecessary here to discuss these obvious essentials. But I may say that those who have attempted to measure representative adult groups are, I think, in agreement that a given test-experiment when well defined and technically adequate need not be temporally long in order to give reliable results and definitely to indicate whether or to what extent the ability involved shows changes with age. The simplest and most fundamental functions if clearly correlated with age need no long drawn-out tests to establish this fact. For example, strength of grip measured by a single quick squeeze of the two hands at the same time registering separately on a double dynamometer gives correlation coefficients with a second series of effort pairs, made 15 minutes later: for the right hand .96 ± .06. for the left hand .95 ± .06; right versus left hand

in the first effort is .88 ± .02. Such reliabilities are satisfactory and they are characteristic of values found even in short tests with a wide age range in a representative adult population. Because we cannot always repeat tests in a single adult survey, or even make them long enough for correlation by halves, or by odd versus even items, we might be embarrassed by the current how-do-you-do of psychology, namely, "what's your reliability?" But actually this other indicator of validity, the consistent score trend, with its variability and central tendency decade by decade, is an adequate criterion of the measurements that have been applied.

The Cardinal Points of Mind

The object of a genetic psychology of maturity is a longitudinal survey of the human-mental being in our familiar contemporary terrestrial environment. The data must be made up from the results in series of measurements representative of whole populations at critical life periods and themselves forming ability outlines or profiles at these critical points. In what direction shall we run our contour lines in planning a study of this sort? What will satisfy our present ideas for a schematically sufficient profile? These questions force us to consider the basic characteristics of human existence that differentiate animate from inanimate and those types of doing that set us off from other living things, from the plants and from the orders of creatures that are not human. We begin thinking of such terms as awareness, movement, adaptation, retentiveness, reason, emotionality, and a string of others—all of them names given in attempts to classify what we are and what we do. For our present purpose we require simply such a working scheme as our tradition of insights concerning things psychological may furnish. In experience and behavior we need to take account of perception, motion, memory, imagination and the capacities for comparing, combining, and abstracting. In the broadly affective nature of mind we must try to probe the states of bodily health or ill health, simple affectivity, and the more complex attitudes and interests. We recognize both variety and com-

plexity in psychological processes. And certainly none is to be thought of as functioning in spacial or temporal isolation. We shall consider that all are simply different ways of viewing mental content. As a classification series they represent scientifically convenient emphases, not exclusive existence, mental or emotional occupancy.

In my investigation of life-age the attempt has been made to introduce experiments or tests that illustrate aspects of each of these points of mind. Some of them are easier of experimental representation than others. One can only hope in an attempt of this kind where purely representative types are rare indeed that if we sufficiently diversify our observations, inaptly chosen as some of them may be, and if we consistently follow through with most of them we may begin at least to outline the maturity map. Features will gradually emerge and at the same time the great open spaces will become more clear.

Briefly, we have so far tried to throw light on the points enumerated as follows: In the field of perception visual acuity has been tested, also facility in color naming and letter naming, and an extensive perception span study has been carried through using letters, numbers, sentences, mutilated phrases, colors and geometric lines with stress on quality of performance rather than speed. Motility (coördination of movement and reaction time) has rather full representation as expressed in simple movements of those expert parts of man's physical apparatus, the feet, hands, and fingers. Measures are included for speed of manual reach and grasp, line drawing and handwriting. In addition a special survey of simple motor skills in young and old athletes has been made. A comparison with large age samples has been made of reaction time to visual, auditory, and tactual stimuli, and a series of muscular fatigue tests with graphic records has also been included. Memory has been examined in a large population by a code test and a brief maze experiment, while smaller subject samplings have undertaken intensive learning of both motor and verbal tasks. Imagination, a very important element in human experience but difficult of adequate

investigation because of its marked subjectivity, has yielded some interesting results. Discrimination and ability in comparison has been measured by letter position judgments and in size estimates. Ability to combine and to build up logical wholes from their parts has been approached through the serviceable McFarlane (**14**) coat assembly test and the painted cube test. Finally, for abstraction, the behavior which we rate hardest and highest and which we fondly believe to be distinctive of our species as the most typically intelligent, we have used two omnibus intelligence tests by Otis (**15**), with their array of verbal and mathematical problems and relations. These offer not only unit measures but also various individual indices of the kinds of material through which we rate intellectual ability. In a part of this study the speed factor has been so far as possible eliminated. Finally, a most important examination of reasoning ability and intellect has been made by Dr. Sward on a matched population of young and old college professors. In the great region of affectivity and personal life adjustment self-estimates of health, energy, handicaps, working efficiency and life goals have been made by large groups. In a smaller population interests and personality traits have been probed by the useful tests of Strong (**25**) and Bernreuter (**2**). The detailed list of experiments attempted may seem long in this recital but I venture to think that it is very short in comparison with the importance of the many sides of human life as it moves from age to age. I shall not attempt at present to give results from each experiment but limit myself to a few sample illustrations from some of the mental compass points.

Some Life–Age Data

The illustrative experimental results derive from the Stanford Later Maturity Study begun in 1930 and continued in 1932.[2] The main testing program of 1930 was made with a population of 863 persons; 335 males and 528 females, in age range from 6 to 95 years; that of 1932 included 1600 persons, 800 of each sex. In both studies as nearly as possible equal

[2] This entire investigation was aided by grants from the Carnegie Corporation of New York.

numbers of subjects were secured at each age decade. Each subject in the general experiment was tested individually in a single two-hour period broken into four half-hour sessions each of which took place in a different room. The apparatus and the various tasks were arranged from the point of view of naturalness, comfort, and interest, as well as in the primary terms of scientific adequacy and significance.

In order to discuss the results concretely, I will differentiate certain life-age periods between which comparisons have been made. Suppose that, omitting early childhood, we use five groups from young to old and call them B, C, D, E, and F. The age ranges represented are then as follows: B, 10 to 17 years; C, 18 to 29; D, 30 to 49; E, 50 to 69; and F, 70 to 89 years. The population chiefly discussed here, that of 1930, numbers in the several groups—B, 90; C, 90; D, 180; E, 320; and F, the 70 to 89 year olds, 130 persons. The few subjects who were 90 years old or older, and those under 10 years are disregarded, that is, nothing will now be said about the limiting groups A and G. I wish to record here that Drs. Keith Sward, Floyd Ruch, and Albert Walton, and Messrs. Charles Marsh, Bronson Price and Roger Barker carried on able independent work or collaborated in securing parts of the data. I am indebted also to my Stanford colleagues, Professors Lewis M. Terman and Calvin P. Stone, for valuable suggestions and for guidance of some of the younger investigators especially during my absence from Stanford in the academic year 1930–31.

Perceptive Ability and Age

Because of its primary importance in individual, social, and industrial life, vision has been selected as the representative function at the perceptual level. Changes in visual as in other forms of perceptive acuity bring striking modifications in behavior, and so for our total picture the importance of fact-finding at this point is large. Vision efficiency, the usual functional capacity of the individual with the help of glasses if these were a part of his regular equipment, was indexed from two distance and one close vision test. When the

combined results are presented for the five age groups, B, C, D, E, and F, in terms of percent of the maximum mean group score, we have a consistent fall from 100 percent in the teen age through 95, 93, and 76 percent to 46 in old age. Subjective as well as objective factors undoubtedly contribute to this result.

A complex perception study made up one quarter of the entire testing program of 1930. It was a tachistoscopic investigation of perceptual span for various types of material with the acuity factor made as nearly constant as possible. It has been easy for critics, including ourselves, to imagine that in some way or even in many ways, a given test situation is not so favorable for the old as for the young. And so in the set-up for this test every effort was made to eliminate age-correlated secondary factors. The results show a curve for performance that rises in the adolescent period B, declines then slightly but continuously to age 60, to fall rapidly from this point onwards. The eta correlations[3] between age and the scores in the different parts of the perception test range between .3 and .6. The discouraging side of this picture is relieved by the fact that none of us quite believes it, everyone thinks himself quick at the job of perceiving. And still both science and industry may find considerable use for a life-age correlation in measures of perception span. The work of 1932 has supplemented these data by measures indicating the ease and orderliness with which consecutive perceptual efforts may be apprehended and verbalized. The score age curves are not dissimilar from the others just described.

Motor Abilities and Age

Fundamental sensory reactions tested by techniques, which I wish I might take time to describe here, were supplemented by performances of motility and skill. Preliminary reports (**17**, **18**) have already been made for some of this material in a field which seems to me especially important because of the industrial problems of older workers. I think that accurate and full age data on motor capacities,

[3] See T. L. Kelley, Statistical method, 1924, Section 71.

both simple and complex, will prove to be worth many times their cost. Reaction speed, motility and complex skills all follow the characteristic age-performance curve. As illustrative results the following may be cited: (1) rotary motility —B 90, C 100, D 97, E 89, and F 72 percent; (2) reach and grasp—B 92, C 100, D 98, E 88, and F 70 percent; (3) finger reaction by extension—B 87, C 100, D 98, E 99, and F 71 percent; and (4) foot reaction—B 85, C 100, D 96, E 94, and F 71. The smallness of the decline in reaction speed in middle maturity and the persistence in later maturity and in old age of skill in rotary motility and in reach and grasp, is very striking. Efficiency in the preceding tests depended primarily on speed but we secured evidence also concerning performance in patterns and habits where self-checking and persistence counted and slowness was not penalized. Tests of accuracy in line drawing and quality in handwriting show less decrement with advancing age than does reaction speed. The maintenance may be due largely to the usual adequacy of visual guidance of movement, but I think we need to note the trend shown here for superiority of performance in older people in tasks where diligence is more important than quickness. Guessed on the basis of what industry has popularly said of the old and also in terms of the derogatory reports made by old people about themselves, the situation has appeared far harsher than the objective data warrant, especially if selective activity in terms of their best functions could be utilized for older workers.

Age and Ability to Remember

The negative relation between age and strength of memory, especially immediate memory, is proverbial. It is not necessarily because they are old, perhaps it is because of the vast multiplication of their experiences, but at any rate old people forget. Measurements of the relative strength of memory and forgetfulness may therefore tell us who *is* old. A simple spacial learning test, a code test and an elaborate series of learning problems show that the decline of immediate memory is relatively rapid and the more marked in later maturity the

more complex and difficult the material to be handled. The relative amounts of learning in a maze were for the five groups B to F: 95, 100, 92, 83 and 55. In the sort of activity represented in daily life in the retention of new telephone numbers the eta correlation between achievement and age for the life span is .67, one of the highest correlations we have found. The Pearson correlation coefficient for the period of maturity is − .65, also an exceptionally high value. In the attempt to learn new material that conflicts with well established older memory habits, such as series of wrong products, $3 \times 5 = 21$, Dr. Ruch found that the older subjects are as a rule tremendously inhibited. The age decrement of learning ability here is as great as the decline of sensory capacity.

Imagination

Results for a single measure of imagination challenge further investigation, for they show extremely slight age change. 1203 subjects, tested with the kinephantom (19), which we may think of as a sort of animated inkblot or Rorschach figure, reported, age group by age group, movement type means between 3.4 and 3.2, (C 3.42, D 3.39, E 3.31 and F 3.22) and mean movement changes between 24 and 22 (C 24.0, D 23.0, E 22.2 and F 23.9) in three minutes time. The consistency in these central values from decade to decade is the more striking since the range in both number of changes and kind is large at every age.

The interpretational activity registered here is correlated neither with intellectual ability as we have measured it nor with age, and although the stimulus is purely visual the response is unrelated to visual acuity. Apparently spontaneous imagination measured here has the quality of true agelessness.

Comparison and Judgment

Measures of the high forms of intellectual effort involved in comparisons and judgments tend to show the relatively late maturation and age-decline type found in complex motion rather than in simple perception. Illustrative of the measurements used is an eduction test in which relative positions are

determined in terms of differing scale size. The five age groups show the following results: B 72, C 100, D 100, E 87 and F 69. The maximal performance persists from young adulthood through early maturity, decline is first evident in later maturity and old age scores little lower in ability than the adolescent mean. Speed is not a factor here and memory is scarcely called upon. The test is difficult and a wide range of success is registered. Perhaps this is an indicator of the rapid rise and slow decline of the ability to take pains to be right. Results for our other measures of comparison and judgment differ from this age-score curve only insofar as extraneous factors involved in them tend to confuse the picture.

Combination and Abstraction

Intelligence test results contain partial measures of combination and abstraction. Standardized as they are on the performance of youth and young adulthood they fulfill the criteria that differentiate levels of brightness at that period. Perhaps a test standardized for middle maturity will give different results. The age-score curve from performance on a standard intelligence test of 2500 adults, (approximately 250 of them over 70 years of age) weighted to represent the level of the general population, shows a top mean of 15 to 16 year mental age at life-age 18, persistence at practically this same mental level through two decades, then gradual decline to old age, registered in the Pearson correlation coefficient $-.50$ for age-score in the period of adulthood (16). Stated in another way, the test ability gain of the last three years in the period of mental age growth is gradually lost in the next three-score years. Does this decline actually indicate diminution in the combining, reasoning and abstracting powers or does speed or some other factor selectively vitiate the results as age increases? Results for 400 adults with the speed factor eliminated show that speed does slacken before power declines. Further examination of the separate items which make up the Otis omnibus test used shows that verbal associations, generalizations, interpretations of meaning, and recognition of relations show marked resistance to the influence of

age. Speed, organization and recall of unfamiliar material, and difficult logical procedures involving a relatively wide immediate memory span show speedier decline. Perhaps I should call the decline registered in our curve not one in intelligence as such but rather a diminution in reaction speed and sum of energy available for new work types. This would mean that the decline correlates with physiological rather than psychological deterioration.

Individual Differences

Although younger adults tend regularly to score higher in most of the measurements made and older adults to score lower, it is by no means true that all of the high scores belong to the young, the low ones to the old. In the most adequately discriminative tests used the measures of dispersion are consistently large from decade to decade. In reaction time 25 percent of the people over 70 years of age were as quick as the average for the total group. In intelligence the standard deviation varies little from decade to decade and here also even when speed is a factor, approximately a quarter of the oldest subjects equaled or exceeded the general adult score average.

Feeling and Self-attitude

I will bring out only a single item from the side of emotional behavior because it throws light on some of the other measures that have been discussed. This is the subjective index of physical and mental handicaps. In the four periods of adulthood the percentages reporting handicaps are C 19, D 26, E 38, and F 50 (men 22, 19, 35 and 44; women 16, 32, 41, and 56). I am inclined to believe that aside from the actual increase of handicaps with increasing age (**26**) the weight of the feeling of inferiority and insecurity due to the decrease in physical strength and energy is itself the most tremendous burden. True information regarding the actual course of development of capacities and abilities with age will, I believe, help to lighten this psychological load.

The Psychological Problem of Life Change

Our biological colleagues have been seeking a generally acceptable theory of old age. The observable facts on the life processes of unicellular and multicellular organisms are so numerous and exhibit such complexity that at present no one theory satisfactorily explains the entire picture. Sometimes it seems that the tap root of life is in the metabolic processes of energy exchange and that old age is just metabolic failure due to the cell surface interferences to the transfer of oxygen and food. Or the life decrement may be reasonably charged to auto-intoxication due to accumulating substances produced by the body which slowly change the biochemical nature and fitness of the inner environment. Some biologists stress the life-death importance of reproduction, and see in the condition of the glands the keystone to the arch. Lastly, but not finally for the biological search, there is the current hypothesis that old age is the result of the continued action of the growth regulator after the period when growth itself has stopped, an action-reaction theory. Biology with its material under the microscope is still in doubt as to why we grow old. Is it any wonder that psychology lacks an explanation of the mental-age phenomena?

It is time, however, for psychology at least to essay some formulation on the basis of the mental performance of the human organism in adulthood and as age increases. Critical samples of data have been presented in an attempt to outline a picture of the age process. It is clear that mature mental abilities are not static fixtures. Measurable change takes place in them. In the fore part of life performance indicates change in one direction, and in the very end of life in another direction. But the change has not a constant rate and what is of most importance, the different abilities do not all follow identical curves. Abilities that rest close to the physiological, for example the sensory capacity for visual acuity, show early and decided decline. But let us note that this life-age loss can be largely compensated for by other and more complex behavior of the person. It is similar with retentiveness or basic memory capacity, although here it is not so clear that

loss begins as early. The change in the curve of memory with increasing age may, however, be offset by the integrative mental processes interpretative of experience. Our data indicate that the higher mental functions, involving those activities which bulk as primarily psychological reach their acme at a later life-age than do the more strictly psychological activities. Motility and the memory functions show their maximal scores not in youth but in early adulthood, between 18 and 29. Manipulations of symbols and of space areas are at their best in early maturity, that is between 30 and 49. Adjustments of motor habits to prescribed goals where speed is not important and the desirable qualitative aspects of comparison and discrimination play a large part, also reach their maximums at this age and continue with great holding power in still later periods. In our kinephantom index for imagination, we find what seems to be one of the most purely psychological measures in the series, in the sense that it is free from the physiological speed and effort factors. Similarly, interpretations of meaning in verbal form, the recognition of generalized truths, and the persistence of standards of excellence in human performance when once established tend to persist to the end of the psychological life span. The results in these activities, abilities, or evaluational capacities are unique among our data in exhibiting almost complete evenness throughout the full range from young adulthood up to the last period of old age. The fact that we have found a few such items seems promising. After all we must recognize that most of our current measurements are really those that have been formulated and developed for use with and for interdiscrimination among young human beings. Psychology has now before it the task of formulating measurements in terms of maturity and later maturity, and of extending backward the use of the techniques for comparisons with youth. Our tests for reasoning and abstraction are standardized for youth. When speed is the stressed element, later life-age demonstrates clear decrement, but if power in unlimited time is measured, then the decrement prior to the years of actual senescence is not so great. The customs and behavior patterns of society

at large in our western civilization tend to force the effort-speed factor into the behavior standards of each individual. In psychology today we are prone to believe that complexity of mental organization and the higher reaches of the mind are really present if and only when we perceive prompt and precise evidence of motor adjustment. But we know that even at the maximum of power there are central configurations of high complexity that may be merely veiled by illness, injury or drug action. A person who himself realizes the state of affairs may if he does not become embarrassed by it, ingeniously circumvent the barriers. When the late Charles W. Eliot of Harvard was about 84 he told me that the chief change noticed in his own powers as he grew older was that he had to give direct visual attention to the performance of manual habits. He said, "If I lift a glass of water I must now keep watch on it or the glass may slip from my hand. A few years ago the hand itself would entirely take care of such a matter."

The thing that is highly significant here is that certain of the more purely psychological processes step in to save the situation when the physiological service has become impaired. When this occurs we have a glimpse of man at his highest level of adjustment rectifying and correcting lower by higher mental process, psychologically organizing himself more and more intricately to compensate for neuromuscular losses. Society should do its utmost to relieve the players in the supreme game from all possible inhibiting weights.

But no matter how far we can delay the final decline or collapse of mental ability, at the last the mind will usually grow old, subservient to the aging body. In looking forward to this ordinarily expected period we have the formula of Cato the Elder: "For myself, I had rather be an old man a somewhat *shorter* time than an old man *before* my time."

For those who prefer to omit entirely the final period of decrement, both mental and physical, we have the encouraging example of her

> "who lived to the age of one hundred and ten,
> And died of a fall from a cherry-tree then."

The Psychological Study of Age

Physical time may be regarded as plus or minus, that is as passing forward or backward according as events in physical systems move in the direction of greater complexity or toward simplification. Astronomers regard time as now moving backward and the universe as behaving in conformity with the second law of thermodynamics. The period of growth and development in an individual organism, since the processes here involved are progressive and irreversible and run parallel with biological evolution, impresses us as certainly plus in character. Furthermore, it has the psychological time quality of fullness and forward extension. These features are implied in our designation of youth as buoyant and hopeful. For the human adult who has passed the physiological acme of life, time appears subjectively narrow and foreshortened; it is greater in retrospect than in prospect, and the period of late age is likened to the running down of the universe. Traditionally this time movement has been viewed differently according as the interest of the thinker has been in the physical, the physiological, or the spiritual aspects of existence. Religion and philosophy have labored to find a gateway through which time of plus character could be found extending indefinitely. Medicine and hygiene vaguely hopeful of discovering the true elixir of youth have been concerned in reducing the gradient or rate of continuous and irreversible negative transformation observed in the bodily organism. And now three hundred years after the birth of Locke and one hundred years after the birth of Wundt, psychology must seek to penetrate the double, new-old mystery with tools of a somewhat different design from those hitherto used by man. Will these instruments merely scratch or will they actually cut? I am bold enough to believe that they will carry us into the human life-age substance a considerable distance, possibly far enough to reveal the essential psychological texture of man's increasing residuum of age-experience and wisdom, in addition to registering the activity of his wearied and hampered sensory and muscular systems. Is it too much to hope that continued psychological analysis of this nature may finally introduce a new interpretation of the meaning of man's life?

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ON THE NATURE OF PSYCHOLOGICAL EXPLANATIONS [1]

BY E. R. GUTHRIE
University of Washington

Classifying psychologists has become a major interest for the increasing number of persons who find it desirable to be able to talk about psychologists and psychology without attempting the more exacting task of talking psychology. 'Behaviorism,' 'Gestalt,' and 'psychoanalysis' are words that can now be used in current magazines without footnotes. Psychologists themselves often find it necessary to choose their party label, and, strangely enough, become occasionally absorbed in partisan denunciations of rival schools instead of working at their science.

Public attention has been directed at psychology and at the classification of psychologists because psychologists have in recent years been offering explanations of human behavior which interest the public. But these explanations are offered in several radically different forms and are, on the face of things, highly conflicting. From the enthusiastic partisanship with which rival explanations are supported it would appear that some of them must be good and some of them must be bad. It is quite time for the consumers of explanations to rise and assert their rights against the professional explainers who too often have things their own way. The consumer is in a position to demand that the merchandise offered him conform to his own needs and to his own specifications.

Explanations are, after all, statements addressed to persons and it is quite possible that an explanation that does not explain to the person to whom it is addressed is no explanation at all, and the hearer is quite within his rights in refusing to accept it.

[1] Address delivered by the retiring vice-president at the meeting of the Western Psychological Association, Stanford University, June 18, 1932.

It is also quite conceivable that there may be more than one good explanation of the same event. Different hearers may have different requirements, and the same hearer may have at different times different uses for an explanation. No listeners can rid themselves of their cultural backgrounds or the limitations of their linguistic repertoires. Absolute and final explanations could only be addressed to celestial and timeless beings.

The demand for explanations is occasioned by our need for getting on in a baffling world. If we are to meet successfully the changes in a changing world we must have some means of anticipating change. Explanations meet this need, and in so far as they are more than mere noise they lead men to anticipate what is to befall them, and in anticipating, to protect themselves and further their interests. The tides are explained when we have pointed out those signs which will enable us to be prepared for them. We cannot forestall them, but we can adapt ourselves to them. In dealing with our fellow men we can with more hope of success interfere and forestall behavior which would harm us, or initiate behavior which would accord with our interests.

The laws of learning are attempts to explain certain features of human and animal behavior. Like all other scientific laws, they make possible the anticipation of natural events from other events which serve as their signs or warnings. And, as with other scientific laws, their validity is measured by their success in prediction in instances other than those on which the generalization is based. An event is explained when it is shown to be an instance of such a law or generalization.

Scientific laws can deal only with recurring events. The unique is beyond scientific treatment, as Aristotle has pointed out. Only in the case of a recurring event can there be selected from the multitude of antecedents those which may usefully serve as its signs.

The blank form of a scientific law may be written somewhat like this: In a certain type of situation (which is usually taken for granted and not expressed) the probability that an

event of the class C will occur is x percent greater if an event of the class A has occurred. If we are dealing not with the presence or absence of A and C,[2] but with their degrees, we may give this the form: In a certain general type of situation, $C = \phi(A)$, the standard error of estimate being z.

In these statements, the general situation, and A, and C may be any events, relations, or conditions that can be clearly denoted by language, or, if we are dealing with quantities, whose measure can be taken. A may be anything whatever that may be seized upon as a warning of C, and C, anything whatever about which we wish to be warned.

The differences between various schools of psychology lie for the most part in differences between the various sorts of terms which replace A and C in the formula, and in varying degrees of concern for specifying x and z, the probabilities of the consequent events.

Now the only requirements that an unprejudiced listener will make concerning explanations addressed to him are that the terms used shall be clear in their denotation, that A shall denote something that he can readily observe, that C shall denote something that he wishes to be able to anticipate, and can recognize when it comes, and that the generalization be based on actual observation.

Certain types of proffered explanations of learning fail immediately to satisfy the requirements just suggested. When, for instance, our seeker for knowledge is told that the outcome will be determined by synaptic resistances, he may well complain that he has no chance to use the information because he cannot observe the synapses, and would not know one with a weak resistance if he saw it. The same objection holds of explanation in terms of dynamic electrical fields in the nervous system so long as these remain unobservable. Not only can the predictions not be verified, but they could not have been based on observation in the first place.

The same objection holds for explanations of learning which are stated in terms of satisfaction and annoyance if these terms are not defined in such a way that they denote

[2] A and C are used to indicate an antecedent and a consequent term.

actions or states that can be clearly observed. It is interesting to note that Thorndike, without professing any behavioristic leanings, does so define them in his *Human Learning* (p. 36): ". . . a satisfier," he says, "being defined as a state of affairs which the individual does nothing to avoid, often doing such things as attain and preserve it; . . . an annoyer being defined as a state of affairs which the animal avoids or changes." These are observable signs on which we can base a forecast.

Explanations in terms of neural pathways are, with a few exceptions, all open to this objection. In certain cases of brain injury pathways become important, especially in indicating what not to expect, but it must be confessed that the information offered us in the physiological sections of the ordinary psychological text contributes practically nothing to our understanding of human nature and learning. In certain types of brain injury, behavior disturbances may lead us to infer the injury, and from this to predict certain other disturbances of behavior. But it may be plausibly argued that 'pathway' explanations are of use only to the pathologist, and that they have nothing to offer the person who is interested in the behavior of normal persons. In normal persons no differences in conduct have so far been related to differences in brain structure. There is no reason to believe that autopsies will ever show whether or not the accident victim intended to post his wife's letter found in his pocket, or whether he preferred pinochle to bridge. If we judge that he was planning a robbery, our judgment will be based on the mask and gun found in his pocket and his police record, but not on evidence furnished by sectioning his brain.

We may decide that explanations in terms of neural events are difficult to verify, and without use, but we can make no such sweeping generalization concerning explanations in terms of end or purpose. Psychological writing as well as common sense makes much use of formulas in which the term *C* which is to be predicted denotes some end result defined without reference to the means by which it is to be accomplished. Since practically all common names of acts are defined in

terms of their end result, and not in terms of their structure, and since it is ordinarily the results of acts and not their structure that have importance for human beings and are worth predicting, it is quite probable that most psychological explanations of learning will continue to be of this type. In fact, learning is itself often defined and oftener understood to refer to the accompliishment of some purpose than to the change of action that brings the purpose about. Learning is measured by success in some such achievement. Most studies of learning display no interest whatever in the means. Success, or the reduction of time spent or of errors made in reaching success, is the observed phenomenon.

Such teleological explanations are of two sorts. In some cases C, the event forecast, is taken to be the purpose of the agent, the learner. In other cases C is not conceived to be the purpose of the agent, but is an outcome which has an agreed utility. Plant behavior is purposive in this latter sense, and most animal and human behavior as well. The plant, the animal, and the man are not always taken to be aware that it is nourishment that they are after, though we may predict that nourishment they will somehow get.

Now it is quite true that the announced purposes of an agent are often carried out. Human beings over twelve months of age talk as well as act, and, since much talk is learned in connection with action, there is a certain amount of relevance between the two, and there are occasions when speech will serve the onlooker as a sign of action to come. Not always, indeed. Not all promises are carried out and not all announced intentions are put into effect.

When a man carries out an announced intention, common sense is content with the explanation that the act was his intention. People often do carry out announced intentions and this mode of behavior is sufficiently familiar to stand as an explanation. But it is very doubtful whether purposive explanations in this, the original sense, can be made scientific, or are the proper subject matter of science. As scientific generalizations they depend on observation of the individual speaker, and a record of the association between his promises

and his performances. Something approaching a scientific treatment of the predictive value of announced intentions has been undertaken by credit bureaus, but, so far at least, not by any psychologist. The psychologist is not interested, because the results cannot be generalized and applied to mankind, but only to certain men in particular, and experience with one man does not extend to others in its application. It is of enormous importance to each person that he learn to anticipate the behavior of his friends from their speech, but he will continue to receive no assistance at this from psychological text-books, and will always be dependent on his own experience.

The fact that men's speech is often useful for the anticipation of men's acts has given rise to a whole mythological galaxy of agents, the will, egos, ids, purposive drives, and the like. Being familiar with persons and their actions, it is as natural to attempt to account for the details of personal action in terms of mythical sub-persons as it was for the Greeks to apply dramatic explanations to natural phenomena. Lloyd Morgan, in *The Crossways of the Mind*, reminds us that the only *persons* we know are complete human beings, and that the analysis of behavior into minor *dramatis personæ* is a use of metaphor that goes beyond any justification.

The primitive notion of purposive behavior undoubtedly derives from the human trait of anticipating action in speech and it is natural enough to regard the speech as the 'cause' of the consequent action, instead of regarding it as a warning only. Such purposive behavior has a number of characteristics. It is not mechanical, which is merely saying that it is not certain. The announced end result may occur in a number of different ways, depending on obstacles and the 'lay of the land.'

These characteristics are also found in behavior that is not purposive in the primitive sense. Plants and animals are predictable in terms of end results though we are ignorant of the means by which these results are to be accomplished. Lacking speech, plants and animals are not able to serve notice of these end results, but nevertheless attain them.

We are apt to speak of these accomplishments in terms of purpose, as if the animal had announced what it was about to do, since we often know what it is about to do from non-verbal signs.

Such 'purposive' concepts are quite legitimate in explaining animal and plant behavior, if we do not make ourselves guilty of reading too much into them. In biology and physiology prediction is normally in terms of states which will probably be maintained through changes in environmental conditions. Children will be like their parents. The blood temperature will be maintained at 37° C. Haldane's *New Physiology* and Cannon's *Wisdom of the Body* make physiology out to be the discovery and description of such cases of 'homeostasis.' Learning has been described by Rignano and by Humphrey as change in behavior that preserves a *status quo ante*, and by Wheeler and others as the preservation of 'least action.'

'Least action' as such a predicted outcome, owes what status it has among psychologists to its indefiniteness. A naive seeker for information who took it literally would be led to expect I do not know just what. Without a definition which will indicate in advance the criteria of least action, the principle cannot be verified, or offer prediction of actual events. As it stands it is not a generalization of any great value. To tell the mother of a four year old child in good health that it may be expected always to keep its activity an absolute minimum might even be misleading.

But in purposive explanations of learning the psychologist may learn a great deal from the physiologist. Physiological explanations conform much more closely to the standards which I have suggested for explanation in general than do psychological explanations. These requirements were, it may be recalled, that the event or state predicted should be clearly denoted and observable, and that this should also be true of the signs to be used in its prediction.

When Tolman, for instance, says that the running of a maze depends on a 'goal expectancy' in the rat, this statement is useful only if 'goal expectancy' is defined in terms of

observable antecedents of the running. If the rat has previously run the maze when hungry and reached food, successive trials will find him cutting down errors, distance run, and time. Now these antecedents are observable. We may, if we do not examine the rat's interior, assume that he is hungry if he has been without food for forty-eight hours, which can be a matter of unambiguous record. Or we may accept certain anticipatory acts, like mouth watering and chop licking, as evidence of 'desire.' Hull has made shrewd use of these in his 'goal-gradient hypothesis.'

When Tolman says[3] ". . . it appears that the rat accepts or rejects and persists to or from food, blind-alleys, true path sections, electric grills, etc., only in so far as these latter function for him as subordinate goals (*i.e.*, means-objects) for the getting to or from the more ultimate physiological quiescences and disturbances," he is using quiescence in the sense in which Cannon speaks of homeostasis. When quiescence is disturbed by stimuli or by other means, we may predict that reactions will occur which will restore it; and if quiescence be systematically disturbed, systematic changes will occur in behavior which will make the disturbance ultimately a minimum. Here the end term which we venture to predict is restoration of quiescence, and the antecedent which we recognize as the sign of this coming restoration is the disturbance. We have here a new form of the instinct of self-preservation.

Well and good, but not too well or too good. I shall not suggest that death seems to be the one goal which living creatures pursue with success. Nor will I insist on a certain danger attaching to the use of such a first principle of action, the danger that we mistake goals for conscious purposes and speak of instincts as if they were agents as McDougall does, or suggest that a certain "means-end-readiness is . . . equivalent to a judgment that the given type of food has proved in the past, and will continue to prove in the future, a 'good' type of means-object route for getting on to satiation" as Tolman does. 'Past' and 'future' and 'goodness' have a

[3] E. C. Tolman, Purposive behavior in animals and in man, p. 28.

somewhat sophisticated clang. This is treating the rat as if it were a man able to tell us his intentions. These are minor objections. There is a more serious lack in such a principle. Its prediction is too indefinite. Knowing that our neighbor will generally do something to restore the quiescent state disturbed by metabolic losses is not enough. We are distinctly interested in knowing just what he will do; whether he will mow our lawn and eat with the proceeds of his labor, or will enter our home at night and kill us in our beds. The end result may be obtained by either means. It is important to know that Mr. X is apt to maintain the homeostasis of his blood temperature by stealing my overcoat.

Prediction must be more specific. This the physiologists have achieved by more detailed observations. When the proportion of carbon dioxide in the alveolar air is decreased by as much as one fifth of one percent, breathing stops, and if it is increased by a similar amount, the breathing rate is doubled.

One refuge of the psychologists has been to list a number of subordinate goals, described as instincts. Food-getting, mating, shelter building, flight from danger, attack on rivals and many others have been offered. Professor McDougall occasionally, though not always, falls into the error of thinking of these instincts as agents, which have their own way to make in the world. But there is a more serious objection to them than that. While it is true that these are results that men accomplish on occasion, the important thing to know concerning them is: Under what circumstances will they be done and under what circumstances will they fail to be accomplished? The answer to this question the instinct doctrine hardly undertakes. Furthermore, prediction of behavior in these terms is almost as vague and useless as is prediction of that quiescence which is the goal of all action. Mr. X, building a house, may seem to be animated by the instinct for shelter until we find that he sells it and uses the proceeds for an alcoholic short-cut to nirvana.

We learn from McDougall that men are instinctively imitative. Now men generally do not imitate. A useful

explanation of imitation must specify the circumstances in which imitation is probable, and the circumstances under which it is improbable. We must have in our antecedent conditions more than mere membership in the species, which is all that is offered by instinct explanations. It is necessary to have data concerning the past of the individual in question.

One form in which this information is offered is of a type which may use as its end term either a result considered apart from the means by which it is attained, or an action defined in terms of muscular contraction considered apart from its results. This is the form offered by Hollingworth which he calls the principle of redintegration. Hollingworth uses this indiscriminately for the prediction of movements, ideas, or the attainment of goals. A movement, a thought, or a happy ending, no matter what its original occasion, may recur when a part of the original situation recurs.

Certainly a great part of our ordinary insight into the behavior of those around us is most readily stated in this form. We may expect from our neighbors the conduct which we have observed in them in the past, if they face situations which have substantial parts of the past situation repeated. Credit bureaus and police records are kept on some such assumption, and they are distinctly profitable because they offer substantial prediction.

Mr. Hollingworth's principle has a certain catholicity about it which is an advantage and a disadvantage. The term to be predicted may be either some outcome, with the movements which attain it unspecified, or it may be specific movements, without regard to their outcome. Since there is in the long run a high correspondence between the movements and their results, we may have prediction in spite of this vagueness. If we usually push the starter button with a certain movement of the right foot it makes little difference whether we predict the movement or the switch contact. Hollingworth has captured in his principle the general form of common sense explanations, but there is a vagueness in the principle that makes it questionable whether it adds much to our understanding of human nature.

Much of this vagueness lies in the fact that what constitutes a sufficient part of the original situation cannot be generally specified. Only after experience with specific 'parts' can we predict with any confidence. There are parts common to all situations, but it is not true that our first response to the world is continuously maintained because parts of the situation are continuously maintained. Because all situations have common parts, and because no general statement can be made concerning the nature of those parts which will prove effective, the principle of redintegration cannot be verified, and is not as it stands the result of observation.

If we judge that the principle of redintegration is not a golden key to the actions of men, sure to make the fortunes of its possessor, we may for the present dismiss it. We may place it carefully in our file under 'R' so that we may return to it if nothing better appears.

Can anything more comforting be said of the principle of conditioning? To this I have already offered some objection. Being formulated in terms of response and not of accomplishment this principle's most serious fault is that it refuses to be interested in the prediction of what most men would like to know. It is not the muscular contractions or glandular secretions of other men that interest us primarily. It is the outcomes of these responses, which can, unfortunately, follow indefinitely varied responses. As in the case of the principle of redintegration a certain amount of prediction of results can be extracted from the principle of conditioning because the world is a rather orderly place and there is a vague general coincidence of response and result.

But the principle of conditioning suffers from the same vagueness that infects redintegration. Thousands of stimuli accompany every response. What combination of these will bring about a repetition? I have in the past suggested that it is a question of their number and their pattern, but I must confess that I have never found any method by which they could be counted, or any rule for selecting effective patterns. Consequently I have no rule to offer by which it can be told in advance whether or not a certain group of stimuli accompany-

ing a response will on a later occasion be followed by the response.

Gestalt psychologists lean heavily toward an interest in predicting results and not responses, and offer many instances in which the result is predictable but the responses by which results are attained are not. And their treatment of the antecedent term is, if we may believe them, peculiar to Gestalt psychologists. The antecedent which determines the outcome is not a single stimulus, but the total situation. Stimulus 1 and Stimulus 2, the twin heroes of those of us who speak the jargon of conditioning, are not the masters of the field, and do not dictate the results. The whole army of stimuli present and their interrelations constitute a totality which is the real determiner of the response.

We may make a number of comments on this. In the first place, this is a doctrine from which there is no known dissent. Most of the precautions taken in the laboratory are taken on this assumption. Fleas may bite a fighting dog without immediate reprisals. Laboratory workers have tried to meet the difficulty in two ways. One of them has consisted in attempting to control the general situation and vary a few elements of it. The other consists in recognizing that there are uncontrollable features and attempting to select those elements or element combinations which give maximum values to the probability of the prediction.

It is hard to see what else could be done by the Gestalt psychologist himself. Since totalities are of indefinite complexity and are unique, total situations cannot be made amenable to scientific treatment except as recurring units. The Gestalt psychologist has a perfect excuse for any failure of prediction, because the total situation, inner and outer, is never twice the same, and hence the results are never twice the same.

What the Gestalt psychologist actually does when he is in his laboratory and not engaged in writing philosophy, is exactly what any other scientist does. He selects or creates a number of instances of a certain type of general situation, and finds what are the most fruitful indicators of the effect in which he is interested.

If Koehler were, for instance, confronted with an animal other than an ape placed in one of his cages with the banana outside and the stick within, and he were asked to predict whether or not the animal would get the banana, what information would he demand as a basis for his prediction?

I am inclined to think that he would ask for much the same information that would be asked for by Watson or by Hunter, or by any other psychologist. His first questions might concern instincts. Is the species carnivorous or herbivorous? Do members of the species use their forepaws for manipulation? Whether we call them instincts or not these are useful items of interest. He might also ask concerning the relative intelligence of the species. Are members generally brighter than dogs or less bright? He might ask concerning the capacity for insight of the individual animal and this question could be answered in terms of previous observation of the animal confronted with problems of one sort or another. One question, if answered in the affirmative, would undoubtedly give him a surer basis for a prediction than any other we could devise. That question would be: Has this individual in the past ever retrieved a banana with a stick? If this is the case, whether we call it an instance of redintegration, conditioning, association, or merely the retention of insight we should be tempted to place a small bet that the banana was doomed.

Tolman would point out that certain added information was desirable. How long had the animal been without food? Had it just eaten to satiety? He would speak of goal-expectancies. Had the animal on the previous occasion been hungry and eaten the banana? If so he would mention that here was a means-expectancy aroused at sight of the stick. These expectancies are here, of course, Tolman's rather than the animal's. It is Tolman that expects the animal to reach the goal and adopt the means. The fact remains that they are justified expectancies, predictions of a result in which we happen to be interested from signs which we were able to observe. These signs were not the expectancies. The expectancies were based on the signs, which included such matters as the species of the animal, the length of time with-

out food, and the animal's previous behavior in similar situations. All of these are particular, observable facts. They do not include the total situation, or, for that matter, any totality, except in the sense that anything mentionable is a totality. No psychologist would ask for any facts except those known by past observation to have a bearing on the probability of the particular outcome in question.

When we have discovered that fifty percent of six-year-old children in American public schools can solve a certain group of problems, or that two adult chimpanzees out of three will within half an hour be outside Koehler's banana under conditions set by Koehler, these generalizations are valid in all languages and for all schools. If we can make further observations and discover that apes reared without loose sticks require an average time of ten hours to retrieve the banana, or that only thirty percent of six-year-old public school children whose fathers are day laborers can solve the problems, these generalizations are also valid without reference to schools. If an investigator of the conditioned response chooses to observe the percent of instances on which a dog will secrete saliva at the ringing of a bell after bell and meat powder have been administered together on fifty successive mornings in the experimental room, we are entitled to question his results only if we have made a similar experiment. We may not be interested in such generalizations, and prefer to observe goal attainment rather than response; the results remain.

The extent to which psychologists are divided into schools measures the extent to which psychology is not a science, but a field for speculation. When psychologists are able to furnish laws based on observation in which the predictable events and their antecedent signs are described so that they can be recognized, these laws will hold for all psychologists and all schools.

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LEARNING AS PERCEPTUAL EVOLUTION

BY ROGER M. BELLOWS
The Ohio State University

Various attempts have been made to formulate a comprehensive notion of the learning problem. Among the views which are available to the student of psychology, few if any are fault-proof in the light of criticism from opposing camps. It is the purpose of this paper to present conditions and principles of learning which are free from these damaging criticisms. A scheme is given which renders the learning process objectively measurable and controllable, and subject to experimental treatment.

The usual defects are mainly of two sorts. The older attempts have been censured as being either (1) argumentative, or (2) atomistic. Standpoints of the former class have been closely akin to the classical notions of egoism, actism, and hedonism. Those of the latter are based on the method of structural analysis. In this latter group are included the doctrines of associationism, structuralism, and behaviorism. The alleged law of effect, or pleasure-pain theory, has embraced both of these standpoints.

The argumentative notions do not lend themselves to experimental technique. They are based on pure speculation. These beliefs culminated in the writings of Leibnitz, Stumpf, Brentano, Ward, Stout, and McDougall. They consider the mind as a nativistic affair, and mental developmental phenomena as created spontaneously in some mysterious manner. Such views have small place in experimental psychology. The scientist is in search of purely objective description and explanation of human and animal behavior.

Many attacks have been loosed against strongholds of the atomistic school. Historically Newton initiated the movement of elementarism in the field of physics. It first became rooted in psychological theory by the pens of Hobbes and

Locke. Their associationism was the first atomistic attempt to explain mental development. These associationists attempted to analyze the mind into elements. The 'simplest parts' of the mind were said at first to be ideas. Later, sensations, images, and affections were said to be the atoms out of which complex experience was made. After having analyzed the mind into these simple abstract elements, a puzzle presented itself. What force causes these elements to adhere, giving us our complete mental experience? This force was *named.* It was called the force of association. The so-called law of association, first expounded by Aristotle, was revived. This notion was refined and enlarged by Thomas Brown and some writers of the English school who purported to explain the cohesiveness of these elements. Such tenets are obviously circular and logically fallacious.

The influence of atomism was carried over into the biological realm by Herbert Spencer, who considered the development of skill as synonymous with the growth of concatenated reflexes. Mental growth for Spencer was nothing but the compounding of reflex arcs. He impresses one with the fact of the continuity of life and the continuity of mind. He has formed a doubtful theory of the growth of nerves and their connections, and their function in adaptive reflexes. In reference to mental function, he states, ". . . its highest manifestations are the effects of a complication that has arisen by insensible steps out of the simplest elements" (**29**, p. 388). From this Spencerian dogma has come efforts to account for learned activity on the basis of physiological structural units, on the assumption that nerve conduction units are strengthened in some manner, either by the repetition of behavior segments, or due to some hedonistic principle.

Watson has considered the formation of conditioned reflexes as the equivalent of learning (**35**). This Pavlovian doctrine of conditioning (**25**) is a further extension of the atomistic scheme into the physiology of movement. While it has governed a multitude of experiments in the psychological laboratories, it has several detrimental features as an explanation of mental growth. The facts of the learning

process have been found to be far too complex to be explained by such a simple neurological theory. Furthermore our present knowledge of neurology does not indicate that specific preferential engrams are formed.

In regard to the notion of conditioning, Köhler states, "As an imitation of physics it is scarcely a satisfactory achievement for the behaviorist to have taken the old concept of reflex action from physiology (including the reflexes of inner secretion) and to give us no further comprehension into the formation of the new individual behavior than is offered by his concepts of positive 'conditioning'" (**18**, p. 55). Again Köhler says, "It is not probable that an observer, looking upon human and animal behavior without prejudices, would find reflexes and conditioned reflexes as the most natural, or as the only, types of function by which his observation might be explained" (**18**, p. 57).

From the field of experimental physiology itself has come the most overwhelming objection against the reflex arc concept. Experiments by Lashley on cerebral function in learning clearly indicate a lack of specificity in neural activity (**21**).

Guthrie (**9**) and Allport (**2**) have modified the Pavlovian concept of conditioning further, in the hope of clarifying the problem of mental development. Guthrie emphasized the proprioceptive sense organs as conditioners. He has a highly plausible theory of the physiology of learning. However a preliminary experiment by Sheldon appears to reflect doubt on this hypothesis (**28**).

In a recent article by Irwin the objection of lack of neural specificity is sustained. Irwin concludes, "This evidence makes it highly improbable that the nerve cell is an independent structural unit of the nervous system. Morphologically and functionally it is a product of physiological factors in the organism. In this sense the organism is the environment to the cell or neurone, and to this degree the organism determines the polarity, the direction of growth, and the functioning of the neurone" (**14**, p. 144).

Our knowledge of neurological function is at present too

meager to be used as a panacea for the ills of the psychologist. The learning problem must be met from the angle of experimental psychology. The formation of adequate hypotheses, and the testing of these by controlled observation, are the steps necessary at the present stage of development of the science. In this connection, according to Lashley, ". . . it is doubtful that we know anything more about the mechanism of learning than did Descartes when he described the opening of the pores in the nerves by the passage of animal spirits. His statement sounds remarkably like the reduction of synaptic resistance by the passage of the nerve-impulse" (**22**, p. 561). Evidence from psychological experimentation does however indicate that as the neurological and physiological systems *grow*, there is a coördinate growth in the psychological processes. One cannot be more definite in regard to the neurological basis of learning. Yet the theories of learning which are the most widely held among psychologists today, namely the doctrines of exercise and effect, are based upon the postulate of the formation of preferential pathways.

The doctrines of exercise and effect do not fit well with the factual evidence of psychological experimentation, according to the findings of Cason (**6**). Similarly Peterson has found that the Watsonian principles of frequency and recency are not always factors in learning (**26**). In the learning process trial-and-error activity has been shown to be nonessential by Kuo (**20**). Rather, random movement merely places the organism in a positional relation with the environment so that learning can take place.

The configurational viewpoint has several valuable aspects in formulating a positive notion of the learning process. It has been found desirable if not necessary to consider 'goal' activity in connection with the learning problem. (The word 'goal' signifies both *motivated* and directed organismic activity. Motivation is defined later in this paper.) This fact is evident in view of the observations of comparative experimental psychologists, a notable case of which is Köhler's work with the chimpanzee (**19**), of such situations as conduce

to learning. In this paper learning shall be defined as perceptual evolution. This statement refers to the *transformation, which is the learning process, of the relation between the organism and the environment.*

The Essential Conditions of Learning

The conditions of learning are many and varied. In attempting to get at these conditions one is thus confronted by a problem of logical classification. If one were to choose a single condition of learning, physiological differentiation or maturation of the organism as a whole would probably be that condition, the other various conditions falling as subentries under that one. In this paper the prerequisites for the learning process shall be fixed arbitrarily at three.

1. *The first condition:* There must be an organism which has developed to a particular stage or degree of physiological specialization. This differentiation is not of the sensory, central, or motor parts alone, but differentiation and integration of the organism as a whole. The amount of differentiation or growth must be adjusted to the scale of acquisition, or to the difficulty of the problem which is to be learned. The lower or less differentiated organism is necessarily limited in acquiring skill or dexterity of performance due to this lack of specialization and integration in the interaction of sensory mechanisms, conductive tissue, and effectors, taken as a unit.

As one considers animals in their order of complexity, starting with ameba and ascending the phylogenetic scale, it is obvious that function is limited at each step. This limitation is imposed upon each individual organism due to the fact that tissue as a whole is not more specialized and integrated. In this connection Herrick says, "Physiologists of the keenest insight have long recognized that reproduction, growth, differentiation and normal function have certain features in common" (10, p. 60). As animals become differentiated phylogenetically function becomes more complex. Similarly, as animals grow ontogenetically, performance may be more intricate.

Either movement or the internal life processes are neces-

sarily a prerequisite for such physiological maturation. The conclusions drawn by L. Carmichael in his careful research indicate the importance of considering maturation as primarily involving internal de-differentiation (4). At this point attention might be called to the fact that both the degree and the direction of differentiation are determined neither nativistically nor empirically. This classical controversy has been pointless. The two factors, genetic and environmental, cannot be separated except in a logical, abstract sense. The end product is a result of the interaction of the two forces. In no way can one consider the organism, even in the early stage of cellular development, as a genetic product (3). The germ plasm is a continuous physical causal factor when considered in its universal relation to the environmental forces. Growth is a product of the reaction of the protoplasm, which behaves with reference to its environment. Retentivity and memory phenomena are one of the functional manifestations of this genetic-environmental relation. Retentivity is here considered as synonymous with growth, which results from the interaction of these two forces.

The memory phenomenon has been one of the enigmas of psychology. Many names have been given it, and sundry neurological explanations have been offered. Semon called it *mneme*. Spearman referred to it as a group factor, almost as universal as his "G" in determining intelligence test results. G. E. Müller insists upon his perseverative tendency. Adams called retentivity a 'universal property of protoplasm' (1).

The power of retentivity is included under the first condition of learning. While no specific neurological correlate can be postulated, a relatively permanent reorganization no doubt takes place in the organism as a whole. In regard to this, Herrick states, "The change in the 'set' or organization of the reacting substance probably involves a slight chemical readjustment of autocatalytic type such as to make a repetition of the discharge easier. It may be transitory or long enduring. This is organic memory" (10, p. 57). Thus memory might be called that physiological change of the organism as a unit which enables the animal to attain more

intricate performances on successive trials, and to duplicate these performances after long latent periods. Extreme cases of performance of the latter type have been pointed out by Warren (34). In this sense retentivity is synonymous with physiological maturation. Memory is the functional correlate of physiological differentiation.

Memory is in reality a psychological affair because the physiological trace, whatever its locus or nature, is initiated by an organismic-environmental relation. The physiological side of the memory problem is a part of (or *is*, as was suggested) the first condition for the learning process. In referring to memory in general an ambiguity sometimes exists as to whether the physiological trace or psychological memory is designated. In this paper *retentivity* is used to indicate the power of retaining physiological traces, which is synonymous with the propensity of physiological differentiation; and the term *memory* is used for the psychological phenomenon.

A living, moving, growing organism is necessary before learning can take place. The power of retentivity is inherent in such a protoplasmic system. Functional changes which are rudimentary forms of learning take place at very early stages in the life cycle. Examples of such early learning are the activities of sucking, grasping, and winking. These activities are learned before birth in many cases. In regard to such early functional changes, Hollingworth wrote, "How we learn our reflexes" (12). These changes are of a rudimentary kind, as they are in evidence at a low level of physiological differentiation. The problem of learning is thus a matter of degree of behavior change rather than one of kind. Such elementary changes take place *in utero* in the case of the human and infra-human mammals. An almost infinite number of neuro-muscular connections are present at the end of the period of normal gestation, the centers for which, experimental evidence indicates (23), function vicariously. The organism must be considered as evolving ontogenetically, structurally and functionally, as a unit.

As growth progresses and the functional behavior becomes more complex and interrelated, sense organs also have been

found experimentally, by Renshaw (**27**), to function in a vicarious manner. He pointed out that dependence upon the sense of touch for localizing in children becomes extinct and is replaced by the visual distance receptors. This transfer between sense modes takes place at or near the age of puberty. Thus to catagorize the organogenesis of sense organs singly is a difficult task, because now one, now another sense department takes dominance in the case of a particular function.

Apparently every set of experimental facts force one to accept the notion that the organism grows and functions organismically, as a unit. This differentiation of the organism as a whole, which includes the power of retentivity and memory, comprises the first condition of learning.

2. *The second condition for learning* is concerned with the aspect of *needs* or requirements of organisms. Learning may take place when these needs are satisfied, provided that the other conditions for learning are present. R. M. Ogden considers learning to be nothing but an improved method of behavior. His concept of improvement "includes both the satisfaction of the creature's needs and solution of its problems" (**24**, p. 235). For Adams needs are, like the property of retentivity, universal properties of all protoplasm (**1**).

The word 'need' as here used is not intended to denote purpose. One is in doubt in employing the more general term of motivation. The latter term generally either signifies purpose in the sense of hormic force, or indicates a specific locus from which the *Trieb* comes, either from within or from without the organism. In this connection motivation is commonly allied with a stimulating condition. For example, Carr designates a motive as, "A relatively persistent stimulus that dominates behavior until he reacts in such a manner that he is no longer affected by it" (**5**, p. 73). Curti holds the same view (**7**). Dashiell distinguishes between native and acquired motives (**8**). The former he calls tissue needs. He reserves the word 'motive' for integrated drives which are acquired, a distinction which, obviously, the present writer would hesitate to draw.

In reality the alleged driving force is a condition which results not from within the organism, nor is its source to be found in the constellations of stimuli of the environment. In considering a psychological process such as learning, one cannot separate or abstract out the stimulating factors from the other causal agents. Improvement in behavior is a unitary psychological process which must be considered in its totality because when the parts are abstracted the supra-summative entity is lost. The entire process must be considered as a unit or whole. There are no precise limits in such phenomena, but only gradations. For this reason Wheeler, for example, insists that the causal relations must be sought by the method of *functional analysis*, rather than by structural analysis (**36**, p. 12).

'Need' is not a telic term. It here simply refers to a condition which has been imposed upon the organism through the interaction of organismic (genetic-environmental) forces. It indicates a lack of something requisite and necessary. The learning process may eventuate if this condition is effective.

All organisms at times need or require certain things from the environment in which they live. To say that an animal is in a state of need ordinarily implies the lack of something. It may refer to (1) the primary biological needs, or an insufficiency of the substances which maintain life, or (2) it may refer to the secondary or social needs. These secondary needs are present in protoplasmic systems of a more highly diversified form. At this level social needs result from the community life of these complex types, who must make finer adjustments to the environmental forces. (3) A third type of need is negative in nature, elimination being one of the necessary functions of all living beings.

Genetically these needs become more and more complex as organisms are able to make greater numbers of contacts with the forces of nature, or as tissue becomes more specialized and irritable. In the higher animals tissue is so specialized that social needs have largely taken the place of mere physical or biological requirements. Due to this differentiation and

specialization of tissue the distance receptors, the eye and ear, not only come to vicariously take the place of the more primitive tactual and kinæsthetic sense cells as the organism matures, as was pointed out above in connection with Renshaw's work (**27**), but also enable the organism to be influenced by more of the environmental forces. Animals at the more complex social level are influenced by these more intricate social needs. These are interwoven with the matrix of biological requirements. The different types of needs thus interact with one another.

This shifting from the less complex to the more complex type of need as animals evolve and grow is evident from a comparison of the activity of a relatively passive animal, such as ameba, with the performances of Köhler's apes (**19**). While the simpler animals, lower in the phylogenetic scale, live passively or vegetatively, the activity of an animal as complex and highly diversified and integrated as the chimpanzee is less passive and more dynamic in nature.

In one of Köhler's observations, called the jointed stick experiment, the ape was provided with two bamboo sticks, each of which was too short to reach the goal. The goal was a piece of fruit which had been placed some distance outside of the bars of the cage. The fruit could be reached and moved toward the cage only if the ape joined the two sticks together. In this experiment is exemplified the interaction of needs. The biological need was brought about by the lack of food. A social need undoubtably operated due to the fact that companions, or perhaps the keeper of the cages or the experimenter himself, were watching the performance, creating the need for recognition or approbation. In any event the primary biological need interacted with other needs. The need for a tool as an indirect means to the goal was the important immediate need in this performance.

The first type of need mentioned above is positive or direct. Something must be taken from the medium which surrounds the organism. In addition to needs of this sort, consummatory activity takes place at times which relieves tension in a negative or indirect manner, the third type of

need cited above. The need for elimination, or organismic stresses resulting from pressure against tissue, constitute requirements under certain circumstances. Examples of function resulting from such needs are sexual and defecatory activity. In the lower forms elimination and reproductive activity goes on in a more or less routine fashion, uniformly. In cases such as division by binary fission of Ameba polypodia, for example, a relatively wide range of changes in the causal conditions in the environmental relation will have no effect upon the process. In some of the higher animals such as the dog, and in man, very minute changes in the situation may alter the entire process. In these latter cases such requirements may constitute one of the several agents that bring about learning.

The motor aspect of those needs which are a result of the privation of essential elements, *e.g.*, oxygen and food, or the need for elimination, have been referred to as the primary instincts by the writers of purposive psychology. These writers have designated the activity which results from social needs as secondary instincts. It is obvious that the function resulting from the various requirements of animals in either case can in no way be considered as hormic. The motor aspect resulting from such needs, given the necessary conditions for learning, is learned conduct.

If the genetic-environmental relation be so adjusted that no imbalance between the two forces exists, no requirement is present, nor is the learning process contingent. There can be no learning without a *specific degree* of physiological differentiation, and a state of paucity in regard to either the biological or social requirements.

3. *The third condition* for the learning process is an obstruction to the smooth activity which might result in the resolution of tensions or the satisfaction of needs. If the behavior resulting in the satisfaction of needs were never blocked by an environmental obstacle, the organism would always be in perfect *balance* with field forces.

Learning was referred to earlier in this paper as the evolution of perception. Perception is here used to designate

the fact that a *dynamic relation* exists between the organism and the many potential constellations of the environment, and that one of these is figure, the rest ground. One dynamic relation is effective upon the individual at a particular cross-section in time.

By 'dynamic relation' is meant any organismic situation in which the organism is in a state of unsatisfied need. This need may be either of the primary biological positive or negative type, or of the secondary social class. It may be a combination of these needs. When needs are not immediately satisfied, an obstruction to the routine passive form of activity is present. This obstruction increases the tension, or condition of organismic imbalance between the organism and the environmental forces, which was brought about by the need. Such an organismic situation is a dynamic relation, as opposed to the vegetative type of relation which usually persists in the lower, less differentiated forms of life such as the ameba.

A dynamic relation is constituted by this condition of imbalance which exists between the organism and the environmental forces. Such a situation of organismic imbalance results from the fact that a condition of need is imposed upon the organism which is not immediately alleviated. The lives of most plants and of many of the lower animals are passive, and relatively free from needs, because most of their life span is concerned with merely the vegetative life processes. One of the simplest and most primitive examples of the evidence of an organismic state of dynamic relation is to be found in some of the lower organisms where activity takes place as a result of changes in light intensity. Loeb called such responses tropisms. Plants show it in the orientation of their stems with relation to light. In the case of animals this phenomenon is illustrated by the behavior of the sea-anemone Actina cereus, the tentacles of which orient themselves in the direction of the light rays. These simple orientations are primitive adjustive responses which are brought into being due to a change in the organismic relation which has upset the nicety of balanced passivity. The movement itself

reinstates or tends to reinstate this balanced, vegetative condition.

The life requirements, *e.g.*, food and oxygen, and the elimination of waste products, take place in a routine manner without overt adaptive reactions on the part of the animal in the case of the lower forms. In this sense it is doubtful whether one can say that all organisms have needs at all times. Needs are not 'universal properties of organisms' in the same sense that surface tension is a universal property of liquids, as Adams has stated (1). Rather the possibility of need is passively precluded in a routine manner, and dynamic needs do not occur in the case of the lower animals and plants. Thus the *potentiality* of need is a universal fact in the plant and animal world, but real, dynamic needs are not universal properties of organisms.

When a dynamic need actually occurs, a strain is set up between the organism and the environment. If the animal is not physiologically mature to such a degree that it is enabled to make organismic adjustments to resolve the strain, either maladjustment or death ensues. *An obstruction to the satisfaction of a need merely intensifies needs*, or augments the strained relation which has been set up by the need itself. Obstructions further or hasten the process of formation of dynamic relations which is already going on.

When an impediment to the routine satisfaction of a stress-strain situation occurs, the perceptual field becomes blurred or distorted. In such a case goals are not clearly defined, and the means to the solution of the problem are not perceived. Ogden calls this a rudimentary state of differentiation, indicating perceptual differentiation. He says, "Differentiation is any process of distinction in which a more integral or 'perfect' form sets itself off from the less integrated ground from which it arises . . . the most primitive type of differentiation is a coarse and ill-defined particularization of an act or event" (24, p. 244). This distortion of the field leads to the true learning process. It is a condition in which the organism is relatively 'out of tune' with the environmental forces. An emotional state exemplifies this condition.

Emotions are identified with extreme degrees of dynamic relations. Emotion has sometimes been defined as disorganized response or as a psychological breakdown. Kantor defines emotion as a 'condition of disrupting chaos and inhibition of action' (**16**, p. 1). When an organism meets a situation for which there is no ready response an emotion is said to ensue. This state persists until the situation is resolved. Emotion, when interpreted in this manner, is the result of the inharmonious function of different physiological systems and parts of these systems in organismic behavior, resulting from an obstruction to the satisfaction of a need. It indicates a state of dynamic relation which was defined above. Emotions in this sense are cases of obstructed goal conduct.

Learning is a psychological process. It depends upon an organismic-environmental relation. Learning takes place, then, under certain conditions of physiological maturation. This protoplasmic substrate behaves with reference to particular environmental relations. The learning process could never eventuate if physiological growth and differentiation were at all times of a sufficient level to passively take care of any of the sundry needs which the organismic-environmental situation might present. Physiological growth must be *mature to a sufficient degree* in any given situation so that the strain might be set up, but not so mature as to harmonize with the level of attainment so that an adequate adjustive response is made without field dissociation or distortion. *The learning process takes place when the gradation of physiological differentiation is coördinate, to this degree, with the intensity of the need and the severity of the obstruction.*

Psychological Transformism

Learning is a process of psychological transformation which is not dissimilar to evolution in the biological realm. In the learning process which eventuates from the three conditions given above, is evidenced the emergence of new patterns or forms. If we adhere to the Darwinian notion of organic evolution, new and higher types come about in the animal

world due to the operation of natural selection. The survival value of a particular species of animal life is inherent in this form because it is suitable to exist in the peculiar environmental relations to which it is subjected. There is at each step a resultant adjustive pattern and the result is survival and adaptation. The end is attained by the interaction of perfectly natural forces.

The growth or evolution of perception is more difficult to observe than is the evolution of morphological types. Nevertheless such psychological evolution takes place. It is the learning process. This evolution of perception may be observed to follow a particular sequence.

In the learning process the perceptual field may be seen to evolve and differentiate in the following chronological order: (1) a homogeneous perceptual field to which the animal responds passively by the routine vegetative life processes, in which there is no imbalanced relation between the genetic (maturational) forces, and those of the environment; (2) definite figure-ground relations in which the passive state of the organism is imposed upon by a vital or social need which terminates this passive condition of the perceptual field; (3) distortion of perception resulting from obstructed goal activity, causing reversed figure-ground relations which result in poorly defined goals and the *dynamic relation;* (4) dissipation of this distortion of the perceptual field, eventuating from reorganization of the field with goals clearly redefined, a condition in which the maturational grade of the organism is sufficiently adjusted to the acquisitional level so that consummatory activity results.

This sequence of perceptual evolution might be illustrated by the jointed stick experiment referred to above. The ape may or may not have been actually hungry before the food object was presented to him outside the bars of the cage. If he was in a state of hunger the motivating process was already started by this primary biological need before the food object, the fruit, was presented. If the ape was not hungry at this time, but in a passive state, no need was present. In the latter case when he first perceived the fruit the need was of a more complex secondary, or social, nature.

The chimpanzees had learned to eat fruit and had formed the habit of eating it whenever possible. The organic need for food has been overlaid by, and interwoven with, habitual and social phenomena due to past dynamic relations which have concerned this or similar situations. The presentation of the food object either initiated or intensified a condition of dynamic relation. The dynamic relation was intensified if the animal was already in a state of need in regard to the goal object; it was initiated if the need was of the secondary social type.

The perception of the goal object brought about changes in figure-ground relations of the perceptual field. The figure or nucleus of the perceptual pattern now became the fruit, the need being operative. Next the tool became figure, the fruit, ground. The organismic tension was present but could not be immediately resolved because an obstacle in the form of the bars of the cage constituted a barrier to the smooth function which would ordinarily lead to the consummatory response. The chimpanzee could not reach the food because of this barrier. A perceptual condition of distortion of the field ensued. This condition is analogous to an emotional state when the latter is conceived as it is defined by Kantor.

Due to this obstruction, distortion of perception results. There is no longer one nucleus or figure in the perceptual field which is clearly defined. The fruit which was formerly the only goal object is not now effective immediately as such. A disintegration of the field has taken place. The stage is now set for the learning process. The necessary conditions have been met.

The learning process consists of a growth or differentiation in pattern, or an evolution of perception. According to Ogden, "When we bear in mind that growth is a form, the contours of which though essential to its complete definition are never absolute or precise save in an arbitrary system, we can see how the same nucleus can undergo a material change of contour without surrendering its fundamental identity" (**24**, p. 246). The figure or goal is perceived, in reorganization of the field, in a different set of relations. The process of

redefinition causes the figure to include the relation of means to end, or a condition of *belongingness* in regard to means, *e.g.*, a tool such as the two sticks jointed, as this is related to the total *Gestalt.* The jointed stick constituted the means to the end, or the tool, in the case of Köhler's chimpanzee. These two particular items, the jointed stick and the fruit, were assimilated into the unitary perceptual pattern—*they coalesced in relation to the other constellations of the perceptual field.* Multifigurations, and figures of reversible perspective, are the most primitive instances of this reorganization of the perceptual field.

The ape, with this evolution of perception, is enabled to secure the fruit by joining the sticks, thereby resolving the tension which was set up first by a need, and then intensified by the obstruction to its satisfaction. To state that an animal is enabled by perceptual evolution to improve behavior or attain a goal is no more mysterious than to refer to an evolved appendage such as legs or wings as "enabling" an animal to get food.

In the successful act the tension is relieved, due to the fact that the need is thereby dissipated. Conduct in reference to this particular situation will hereafter be of a routine nature as long as the physiological level of differentiation remains identical, otherwise the learning process must be reënacted to the extent necessary to overcome the dynamic relation. On successive trials the learning process is present because of the devolution or retrogression of the physiological or protoplasmic substrate. Such situations as are only apparently partially identical in the sense of identical elements (and in which the conditions which brought about the dynamic relation are in reality nearly identical) must be relearned to the extent necessarily required to bring the physiological level up to its previous grade, or to its status at the time of the former consummatory response. In this sense the functional operation of the residuum of former dynamic relations is memory. This physiological residuum of former performances is synonymous with physiological maturation. Memory is inherent in the first condition of learning—physiological growth.

Under the first condition as outlined above is included the power of protoplasm to retain changes which are brought about in it by the interaction with the environmental forces, and by activity and the life processes. No strained relation between the organism and environment is completely resolved. For every strain that is set up there is always a minimum residual stress. This vestigium of former dynamic relations is retentivity, and its functional or psychological correlate is memory. Due to the devolution of the physiological grade (which has been referred to as 'forgetting' or 'dim memory images' in the older psychologies) is caused renewed distortion of the field on successive presentations. Learning must take place in direct proportion to the amount of renewed distortion which is thereby caused.

"Where minds differ is in organizing power" (11, p. 6). Animals of the same and of different species do not have equally mature physiological systems with which to (1) be thrown off equilibrium, and (2) to reorganize the field. The definite cellular tissue of receptors in the higher forms has been differentiated from the simpler, and enables these organisms to be influenced by more of the energy configurations of nature about them, than is the case of lower forms. Differentiation of tissue, implied by evolution of the race and growth of the individual, enables children or adults, or any organism, to be placed under a condition of dynamic relation by the environmental forces in interaction with the protoplasmic system. Sense cells of eye and ear, for example, are so complex and differentiated as to cause the possessor of such relatively fine biological equipment to be sensitive to minimal energy changes of the environmental forces. This propensity of irritability due to such differentiation varies from species to species and from one individual to another, and even from one sense cell to another in the same individual.

Obviously learning in higher types is apt to take place in the case of the organism which is capable of being placed under strain by minimal energy changes in the environmental envelope of their sense cells. Under comparable conditions in the case of a lower animal, a state of maintenance of

equilibrium predominates. The higher forms are occupied chiefly, in so far as learning is concerned, with the acquisition and maintenance of equilibrium.

The possibility of reorganization is a factor governed by physiological growth, not particularly of receptor cells and nervous tissue, but of the organism as a unit. The state of equilibrium is reacquired by the total body postural tonus resulting from activity of muscles and glands governed by nervous tissue, as a result of tensions brought about by the environmental obstruction to the satisfaction of needs. Examples of this process in the case of tensions of sex and hunger are commonplace.

Such tensions may be resolved in a number of ways. Wheeler (36) lists compensation, introversion, identification, rationalization, sublimation, regression, defense mechanisms, and functional neuroses as methods of resolving tensions in the human. Such resolutions are reorganizations of the perceptual field resulting from blocked social needs, and are *special cases of the learning process.* A high type of organized goal defining perception is necessary for the substitution of one need for another. The activity resulting from such reorganization is definitely in the nature of circumvention of obstructed needs, amounting to reorientation of perception. By this perceptual reorganization the severity of some needs is mitigated by the satisfaction of other substituted needs.

Some tasks are said to be "difficult." By the hardness of a task is meant the degree of physiological equipment possessed by the performer in relation to the severity or intricacy of the blocking obstacle which impedes reorganization of the field and resolution of the strain. Difficulty of the task depends upon three variables, viz., the level of growth, the severity of the blocking obstacle, and the intensity of the need which motivates the animal to act. The degree of difficulty of a learning situation is, then, dependent upon the following variables: (*a*) level of physiological growth, (*b*) significance of the need, or "intensity" of the requirement, and (*c*) rigidity of the obstruction. Thus the difficulty of a particular learning situation may be expressed by the following

proportions: *a* must vary directly with *b*, *a* must vary directly with *c*, and *b* directly with *c*, for a situation conducive to a maximum amount of learning. The variables are measurable and controllable experimentally, and fruitful experimentation might profitably follow this plan of analysis.

At the social level certain patterns of behavior, undesirable to the community, arise due to unusual strains or dynamic relations imposed upon individuals. These result from abnormally severe motivating and blocking factors in combination with inadequate physiological differentiation. In extreme cases of permanent or lasting dynamic relation such so-called mal-adapted types as the paranoid result.

Similarly the speed of learning may be said to be the result of these three forces interacting. Learning of skills is a slow process. Peterson's subjects took much longer to learn their ball tossing tasks than did Köhler's apes in learning problematic cage situations. More gross, less differentiated structures function in the former case.

In regard to the possibility of the quantification of these variables, tensions have been measured by the obstruction method by Tsai (**30**), Warden (**31, 32**), and Warner (**33**), by accurate and reliable technique in the case of the albino rat. The organismic equation which is concerned with the functional correlate of physiological differentiation in the context as outlined above, is being quantified by means of maze and problematic experimentation in the comparative field, and in the laboratory of the experimentalist and clinical mental tester in the case of human subjects. Productive psychological knowledge of the learning problem will result from this angle of attack. The work of the psychologist is this type of functional analysis, perfection of techniques of measurement, standardization, and controlled observation of learning situations.

Summary

I. The essential conditions of learning may be said to be concerned with: (1) The rôle of the fundamental degree of physiological growth which must be adjusted to the level of acquisition. Retentivity is considered as synonymous with

physiological differentiation. (2) The increasing *needs* of protoplasm, which impose a condition of *dynamic relation* upon the organism, and which are, (*a*) primary biological needs, (*b*) social needs, (*c*) negative biological needs, and (*d*) combinations and integrations of these needs acting as motivational factors. (3) Obstructions to the satisfaction of needs, which further the process of the formation of dynamic relations.

II. The nature of learning consists in psychological transformism in which there is a definite sequence of perceptual field evolution.

III. Phylogenetic and ontogenetic differences in learning propensity result from differences in degree of differentiation and irritability of tissue, upon which the formation of dynamic relations and perceptual evolution depend.

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SOCIAL NUDISM AND THE BODY TABOO

BY HOWARD C. WARREN
Princeton University

I. The Taboo of the Human Body

The wide-spread taboo attaching to the human body is a noteworthy phenomenon of social psychology. Clothing is worn, not merely for protection or for adornment, but to conceal various parts of the body from view. Clothes are not needed for protection in swimming, gymnastics, tennis and certain other sports, nor in rhythmic dancing. In most of these diversions there can be no question of adornment; in some cases garments interfere with the purpose of the activity; in some they may even be detrimental to health. Yet social pressure compels the wearing of *some* clothing in all these pursuits.

This taboo of the body is fairly universal. It is found among savage and civilized races alike, and prevails in all climates. Most investigators in this field have been interested in the origin of clothing rather than in the rise of the taboo. The two problems are distinct, though closely related. The origin of the impulse to cover the body has been variously explained by different writers. It has been attributed to the need of *protection* from cold, insects, dampness, excessive heat, rough soil, thorns, evil spirits, etc.; or to the craving for *adornment*, especially in order to promote sexual attraction. A number of writers ascribe the origin of clothing to a primitive *modesty* instinct, which would make the body taboo a native or inherent trait of the human race. J. C. Flügel (1) reviews these conflicting theories at length. The reader is referred to his monograph and the sources which he cites for full treatment of the topic.[1]

[1] Flügel's treatment of the psychology of clothing is thorough and well-balanced, except for his frequent interpretation of the phenomena in terms of a far-fetched sex symbolism. Attention should be drawn especially to the works of Havelock Ellis, Surén, Langdon-Davies, and Wundt, and the articles by Dunlap, Sanborn, and Bliss, cited in Flügel's bibliography, which treat of the modesty response and body taboo.

The present paper is not concerned with clothing as such, but only in its relation to the taboo which requires concealment of some portion of the body by a covering device. Nor shall we consider the esthetic, hygienic, and ethical problems connected with clothing and nakedness, except in so far as they bear on the psychological aspect.[2] Of special psychological interest is the strength and persistence of the taboo—the fairly general social ban on human nakedness prevalent at the present time and in many earlier cultures. The experiences associated with contraventions of the taboo are all phenomena for psychological investigation. The effects on human behavior and attitudes of breaking the taboo form the main topic of the present paper.

Among the Greeks, in their golden era, the taboo was partly lifted. Games and athletic contests were engaged in by men and boys, in the nude, before crowds of spectators.[3] The very term *gymnastics* signifies literally *unclothed exercising*. The Greeks also emphasized the nude in art, a trend which was followed by the Romans, and was revived during the Renascence after centuries of rather rigorous restriction.

Numerous other instances of dispensing with clothes on special occasions are noted among various peoples, ancient and modern, the most common being in out-door bathing and the posing of artists' models. In the main, however, the

[2] The pleasing or displeasing effect of the uncovered human body on the beholder has an undoubted psychological bearing, and the effect of nudism on health and morals becomes at times a factor in the social attitude toward the practice.

[3] Thucydides, bk. I, 6. Plato, Republic, V, 452. Girls apparently wore a short tunic in foot-races and a pantlet for wrestling. Plutarch (Lycurgus, 14, 15) states that Spartan girls and boys marched 'unclothed' in certain processions and engaged 'unclothed' in athletic contests. According to Athenæus (XIII, ch. 20) young men and girls wrestled together 'unclothed' in the gymnasiums in Chios in his own time. But the adjective *gymnos* (γυμνός) used in all these passages often means *lightly clad* or *in undress* rather than completely nude. I have found no vase pictures of naked girl athletes, though there are innumerable such representations of men and boys. Since the Spartans did not adorn their pottery with pictures, this is not conclusive with respect to Spartan girls. In consultation with colleagues in the Greek and archeology departments, I have made an extensive examination of the classic writers and modern books on Greek athletics. They furnish no decisive evidence that the body taboo was lifted for girl athletes. But weight should be given to the statements of many classic authors that boys and girls were treated very much alike in the Spartan system of education.

taboo has held in respect to general social intercourse. Nor are there any great regional differences except in respect to the amount of clothing prescribed. The Fuegians, living in a sub-arctic zone, wear little or nothing;[4] most African tribes cover at least a small portion of the body. The Eskimo, though compelled by climate to wear heavy clothing, strip off everything but a small pantlet within their igloos.[5]

Historically, the taboo has taken a number of different social forms. Rigorous anchorites have held it sinful to contemplate one's own body. This *complete taboo* has been sometimes inculcated in modern girls' schools as well as in nunneries. The taboo to exposure of the body before any one, even those of one's own sex (*objective taboo*), is one degree less rigid. A third form, still less restrictive, is the *familial taboo*, which forbids exposure as between parent and child and even between husband and wife.

Among the Semitic races this form of the taboo seems to have prevailed in early times. We read that when Adam and Eve discovered their nakedness they made aprons to cover themselves, although they were alone.[6] And when Noah lay naked in a drunken stupor, his two sons walked backward, carrying a garment with their faces turned away, and covered their father without looking at his body.[7] It thus appears that the taboo among the Hebrews was not specifically sex-directed, but was distinctly familial. A taboo of the same sort existed among the Romans.[8]

The least rigid type limits the taboo to exposure of the body before those of the opposite sex, which carries with it the prohibition of nudity in any mixed group. By the term *social nudism* is meant the lifting of this *intersex taboo.*

In addition to these different types, the taboo has varied widely on the degree of covering prescribed and the parts of the body which are required to be covered. While these dis-

[4] C. Darwin, Naturalist's voyage (Journal of researches), London: John Murray, 1845, p. 213.

[5] W. Thalbitzer, The Ammassalik Eskimo, part I, p. 29.

[6] Genesis, 3: 7.

[7] Genesis, 9: 21–23.

[8] See Cicero, De officiis, I, 129; Plutarch, Marc. Cato, c. 20.

tinctions are not especially germane to our study, it should be noted that the taboo is not always directed toward sex differentials. "The Turkish woman veils her face; the Chinese would be ashamed to show her naked foot in public; the Arab has no concern at showing herself naked but covers the back of her head. In Assam the women cover the breast only; among certain tribes of the Philippines only the navel is accounted indecent." [9]

Early in the Christian era arose the notion that the human body is shameful and that to expose any portion except the face and hands is indecent. This led to the complete taboo already noted. But with the Renascence the Greek ideals began once more to be felt. The two opposite ideals of body grace and body shame contended with varying results. In general a compromise was effected, whereby the display of the human form was sanctioned in art, but forbidden in nature.

In recent times the extent and direction of the body taboo has varied in different races and generations; but, however directed, it has remained essentially a taboo, and generally an intersex taboo. In most Western lands men and boys may bathe together in the nude, but not when women are present.

The taboo in its social form has been especially rigorous in the Anglo-Saxon races. In America, under Puritan influences, it became transformed from a mere social convention into a moral principle. Any uncovering of the entire body, except in the privacy of one's own chamber, was termed 'indecent exposure' and was (and is still) subject to severe legal penalties. Missionaries promulgated this doctrine among primitive peoples. Converts were provided with ample garments, which in tropical climates often proved injurious to health and bodily stamina. At home, certain paintings were proscribed and statues were provided with the conventional fig-leaf.

The body taboo reached its climax in the mid-1800's. In England and America clothing was multiplied, especially for women, and it became improper to mention almost any detail

[9] H. Surén, Man and sunlight (Engl. trans.), Slough: Sollux Publ. Co. 1924, pp. 87–88. Herr Surén has traveled widely and writes from personal observation.

of the human body in a mixed gathering. A woman was allowed to have head and feet, but between the neck and ankles only the heart and stomach were permitted mention in polite society.[10] To expose the ankle (even though properly stockinged) was considered immodest.

An interesting episode occurred at Brook Farm, a radical settlement formed in the 1840's in Massachusetts. A few ultra-radicals in the group attempted a protest against the prevalent taboo. They made it a point to sit before their front doors quite unclothed on Sunday mornings when the rest of the community were passing on their way to church.[11] This seems an almost isolated instance, and was referred to later (during my boyhood) almost in a whisper.

The reaction started toward the close of the 19th century, when certain *fin de siècle* unconventionalities in clothing appeared. At the time they were regarded as daring contraventions of social laws—today they would seem quite commonplace. It was some 15 years later that the revolt began in earnest. Fewer clothes, especially for women, became the order of the day. The elaborate bathing costumes of the Victorian era gave place to one- or two-piece bathing suits, which have become progressively modified on certain beaches to the minimum requirements of Anglo-Saxon standards of decency. All this, however, was merely a *dimensional* modification of the taboo. The underlying principle—concealment of certain parts of the body—still remained, and was quite as strong as in the past.

Recently in some parts of the United States sun-bathing has begun to be adopted, but almost always in solitude or with segregation of the sexes. The obvious benefits to health from this practice have overcome many of the traditional objections to bodily exposure in the open and have led to some challenge of the taboo itself. In particular, familial nudism has become more common.

[10] The taboo of certain words as indecent or profane, and the exclusion from social conversation of such topics as the excretory and reproductive functions, belong to a separate field of investigation, though intimately connected with our topic.

[11] G. W. Curtis, in Editor's easy chair, *Harper's Mag.*, 1869, 38, p. 270. Mr. Curtis had spent some time at Brook Farm in his boyhood.

At the same time, reports of the German nudist movement reached America and were received with less shock than would have been the case a few years before. The accounts were not always accurate, and the stories told regarding the less thorough-going nudism in France were misleading and often calumnious.

In the spring of 1931 the Merrills' book, *Among the Nudists* (3) appeared, a pioneer work in English, which gave a detailed account of the movement for social nudism in Europe, particularly in Germany. The authors, a young married couple, describe their own experiences at a nudist park near Lübeck, drawing an attractive picture of the life there, its benefits, and attractions. About the same time Parmelee's *New Gymnosophy* (5) became available for American readers. In this book the theory of nude living is treated from every standpoint and its beneficial effects emphasized. Though the psychological side is not given separate treatment, there are many details which bear on this aspect of the question.

II. Some Contemporary Opinions

Although raised in a family and community where the body taboo was strongly emphasized, I had for many years questioned the reasonableness of the traditional attitude. Being without definite knowledge of the nudist movement in Europe, the Merrills' book attracted my attention. There was a certain hesitancy, due to life-long training, about going boldly into a book-store and asking for a volume bearing such a title. The inhibitory effect of the taboo was finally overcome, and the perusal of the book aroused interest in the psychological aspect of nudism as well as in its practical value. Whereas social exposure of one's body had been associated in my mind with exhibitionism, this account indicated that, as practiced in Germany, social nudism is altogether devoid of exhibitionistic elements. If so, then the taboo has merely a conventional basis, and may or may not be reasonable.

To test the practical value of nakedness I formed the habit of daily sun-bathing in seasonable weather. A secluded garden at home and a shielded roof in summer made this feasible.

the outcome being a notable improvement in general health. A natural corollary was the discarding of clothing at night.[12]

It is of psychological interest to determine the general attitude of the community toward sun-bathing and social nudism. This I was able to test in a limited sector of society. For the past eighteen months I have made it a point to mention my sun-bathing to friends and acquaintances whenever opportunity offered. Contrary to expectation, scarcely anyone appeared shocked at the notion of complete body exposure—at least in solitude. All seemed interested. Many responded most cordially, or suggested that I had joined the nudists.[13]

I found a number of cases in which married couples were accustomed to bathe in the ocean or lakes without suits; and several men who had given up wearing clothes at night. There were families here and there who were bringing up their children to spend part of the time without clothes, in the house or yard—often boys and girls together—the latter practice serving as an antidote to the harmful sex-curiosity and prurient thoughts which are otherwise inevitable in adolescence. Since these data were collected from different parts of the country and were apparently not due to any organized 'movement,' they seemed to indicate a definite social trend among the intelligensia class in America.

As regards *social* nudism,—that is, the association of adult men and women, quite unclothed, for exercise and sport—the attitude generally was less favorable. Many were definitely shocked at the notion, or treated it with ribaldry. Others, while open-minded, were inclined to believe that such association would inevitably foster immorality. A few were favorably predisposed. Nor could one readily predict the attitude of a given individual from previous knowledge of his or her

[12] One who is accustomed to sun-bathing can sleep comfortably without covering in a room of 70–72° F., except during two or three hours when the vital processes are lowest; then a single sheet is sufficient. When lying in a room of this temperature without covering I often experience the sensation of being covered with a soft, filmy tissue.

[13] To several conservative friends who asked whether I put on a bathing-suit, I admitted wearing spectacles and wrist-watch. The incongruity of this 'garb' always extinguished the shock.

general character and disposition. In the main the conservative individual reacted unfavorably; the progressive mind was disposed to think the experiment worth trying. But there were notable exceptions. I was surprised at the adverse opinion expressed by some who would be regarded as distinctly liberal in thought, and at the receptive attitude shown by some ultra-conservatives. In general those of the younger generation were inclined to be open-minded or neutral, while middle-aged and elderly people were either strongly opposed or else quite favorable.

The objections urged against social nudism were of the most diverse sorts. The most naive was that "even savage tribes wear *some* clothing." This was not an isolated opinion —it was mentioned several times. The fallacy lies in the word *even*. The prevalence of a custom among savages is no evidence of its utility among civilized peoples.

There were the usual objections on ethical grounds. And in many cases those who saw no such difficulty were averse to social nudity for esthetic reasons; the average human body is ugly, they declared, and needs clothing to mitigate the displeasing effect on the beholder. One rather portly friend (a psychologist) who voiced this sentiment, modified the usual conclusion by adding that if we were all compelled to show ourselves naked, we would take greater care of our bodies, and would be more shapely.

None of these objections seemed to weigh against the benefit to health and body stamina which exposure of the body to light and air affords. The only objection that appeared worth considering was the suggestion offered repeatedly by male friends, that the uncontrollable virile reflex might cause embarrassing situations.

In the fall of 1931 the Merrills were preparing a second book, dealing with nudism in our own country (4), and wished to include the opinions of representative physicians, psychologists, and philosophers. At their request I furnished a list of some 85 American psychologists, chosen on a strictly objective basis—a list comprising the past officers and councilmen of the American Psychological Association. To all

these a questionary was sent, asking their opinion on social nudism for exercise, sport, and recreation. The authors were warned in advance that psychologists are flooded with questionaries of all sorts, and are consequently averse to answering unless especially interested in the subject or alive to its scientific value. As was to be expected, not more than half responded, and many of these simply expressed a lack of knowledge on the subject. A few mentioned certain benefits to be expected from the practice and certain objections, without expressing any definite opinion. Those who gave a personal judgment were about equally divided for and against the practice of social nudism (4, ch. 9). A number of those who favored nude exercise questioned the advisability of its practice by both sexes together.

A striking characteristic of the replies was the fact that the opinions were all based on purely theoretical grounds. Apparently no American psychologist of the group examined had ever had the experience of social nudism. This is perhaps accounted for by the newness of the practice and the legal difficulties which it encounters in America.

The question is of such importance in social psychology that it deserves a first-hand study by those interested in social behavior. Two fundamental psychological problems are involved: (1) Is the traditional taboo of the human body an *inherent factor* in human nature? (2) Is social exposure of the body *indecent* or obscene, as the general opinion and laws of most civilized lands insist?

III. An Experience in Social Nudism

On the occasion of the recent International Congress at Copenhagen I had an opportunity to test these questions to a limited extent by personal observation. Landing at Bremen some 10 days before the meeting, I went at once to Klingberg, the resort visited and described by the Merrills. The place itself and the life there have been so fully portrayed in their book (3), and more recently by a young American woman, Jan Gay (2), that they need only be sketched briefly.

A small comfortable inn, the Landhaus Zimmermann.

Near this a park of many acres, thickly planted with pines among which many narrow sandy paths lead hither and thither. Within this park a number of small cabins for sleeping quarters, several leveled open spaces for games, and a sun-exposed grassy slope for sun-bathing. Across the public road from the park, on the borders of a lake some two miles in diameter, a private bathing beach belonging to the establishment, well screened from the road.

Paul Zimmermann, the owner, is a pioneer in the practice of nudism. He acquired this property in 1903, before the movement really started in Germany. Here he brought up his family according to nudist principles, planted the property with trees, and when the necessary seclusion was attained, extended the privileges of the park and beach to accredited guests, who must show their good faith and proper motives before they are granted admission. Meals are served at the Landhaus, where clothing is required[14]—usually some sport suit, without stockings or tie. In the park and at the bathing beach clothing is usually dispensed with. A bald head may be protected by a cap. Shoes or sandals are worn by those with tender feet; short trunks are worn by women during the menstrual period. For the most part the guests wear no clothes whatever.

I arrived in the evening. After breakfast next day I read and signed the regulations and was given a formal admission card to park and beach. Herr Zimmermann showed me over the park, which happened to be quite deserted, and then took me across to the bathing beach. There we found some 30 men and women, of all ages, including a number of children. Some were lying on the grass, sun-bathing. Others were seated on benches chatting. A few were exercising or playing volley ball. A number were swimming in the lake. We hung our clothes on hooks at the open-air *garde-robe*, and Herr Zimmermann introduced me to a party of men and women grouped together, seated on a bench, or lying on the grass.

It was my first experience in social nudism; yet I felt no

[14] This because the Landhaus is outside the park, and therefore a quasi-public place. In many nudist parks no clothes are worn at meals.

embarrassment whatever at my own lack of clothing, nor any shock at the sight of the men and women about me in the same condition. One of the men was English, one American, the other men and women were German. We chatted for a while without the slightest constraint on my part. Then I joined some of the group for a swim in the lake.

It has long been my conviction that the wearing of clothes for bathing is an absurdity. As well stuff the ears with cotton when listening to a concert, or put on dark glasses in order to enjoy a picture gallery or a drama. But it had never before been my fortune to bathe without a suit, in any body of water larger than the household tub. The new experience exceeded all expectations. The difference between bathing with even the scantiest suit, and bathing in the nude, can only be compared to the difference between a partial and a total solar eclipse—the phenomena in each case belong to two distinct categories. After a few minutes in the water we came out into the warm, sunny air, to lie on the grass or on a blanket, first running to and fro or engaging in a game of ring-toss in lieu of a rub-down. One chatted awhile with his neighbors, men and women, then another dip, and so for hours. It was not unusual to indulge in a dozen dips a day. The children of course were in and out of the water all the time.

Later in the morning most of the group returned to the park, to roam in the pine woods, or engage in ring tennis, or lie on the hill-slope for a sunbath, before dressing for dinner. Many of the visitors, including the writer, combined work with recreation. Some read or wrote or studied, some instructed one another in German or English, some sketched and painted, while sun-bathing.

In the afternoon much the same program. In spite of the seeming monotony one never grew satiated. The Merrills came in 1930 determined to spend a week if the first day did not prove too shocking. They stayed a month. Last year Miss Gay came for a week and remained six. Since I could neither postpone nor forgo the Psychological Congress, my visit was limited to eight days; in other circumstances it would have extended to at least a month.

The diet at the Landhaus is strictly vegetarian. The authors whom I have cited suggest a certain unpalatability in the fare for a steady regimen. The present writer found no such difficulty. For eight days he had no trouble in confining himself to what was set before him, without resorting to the neighboring Waldschänke, where a meat dinner could be obtained. The Landhaus is also strictly non-alcoholic, and smoking is prohibited in the park, though not elsewhere. This union of vegetarian diet and other restrictions with the practice of nakedness is common in nudist communities and is held to be an integral part of the cult.[15] Personally I see no reason for the connection. Social nudism means the lifting of an unreasonable taboo. On the other hand the value of complete abstention from meat has yet to be demonstrated.

After two nights at the Landhaus, I was fortunate enough to secure a cabin in the park. This particular cabin was appropriately called the Rousseau-hütte. The park cabins are small and of rustic design. A rude bunk, with an upper berth; a table and chair; a wash basin and mammoth pitcher (but no waste receptacle); hooks for clothes, and a floor of pure sand. Everything in keeping with the ideal of nature-living. Rooming in the park itself, one is able to experience not only sun-bathing, but air-bathing at all times.

For me there were three especially notable phenomena in the life at Klingberg. The first was the sudden and 'painless' removal of the body taboo. The naked bathing and swimming was another episodal experience more deeply felt even than the first.

The third striking experience was the morning gymnastics. Soon after 7 the physical culture teacher, Herr Lühr, strolled into the park beating a tom-tom. At the sound the guests trooped from the Landhaus, from the park cabins, and from neighboring *pensions*, and gathered at the tennis court. Those from outside the park threw off their bathrobes, which the cabin dwellers had dispensed with, and all formed a circle on the hard court. The exercises consisted of running, arm swinging, body bending of various sorts, leg lifting, and other

[15] Many, perhaps the majority, of the Klingberg visitors were not vegetarians.

vigorous muscular activities. They lasted about an hour. There is a distinct joy in the free movements of the naked body which is lacking when one is clothed in the conventional gym-suit. There is also a delight in watching the play of muscles in those about one. The drill was accompanied by the rhythmic beat of the tom-tom, while the teacher shouted directions and set the pace.

After the exercises, which left one in a glow, everyone sped to the Moorteich, a small pond within the park, for a plunge, and the park-dwellers repaired to the open-air shower at the pump for morning ablutions before dressing for breakfast.

Had I not already practiced sun-bathing, this would have ranked as another episode. Though the experience was not entirely new, I found a vast difference between sun-bathing in the solitude of one's own garden, apprehensive lest a neighbor peer through the hedge, and this sun-bathing in a group of friendly men and women, without fear of prudish comment. The first is a task, the other a recreation. There is also a peculiar joy in wandering naked through the cool pine woods, whether by day or by moonlight, which is far superior to air-bathing in a restricted garden.[16]

IV. Psychological Aspects of Nudism

This sketchy account of an actual experience of nudist life, which it has been difficult not to elaborate and punctuate with emotional adjectives, will explain why for the first few days the writer forgot to psychologize. One is so filled with the many novelties, so intent on enjoying the strange and absorbing mode of life, that he has no time to analyze the experience—no thought of studying the problem of social nudism as it bears on the body taboo.

It was perhaps the third day that the psychologist began to emerge from the human being. By that time I had seen and experienced enough to offer a tentative answer to some of

[16] Stanley Hall describes an experience of his own in air-bathing (Recreations of a Psychologist; New York: Appleton, 1920, pp. 324–5); and Benjamin Franklin in 1768 speaks of spending half an hour or more naked in his room before breakfast, reading or writing, and terms it "a bracing or tonic bath" (Works; Hartford: Andrus, 1845; pp. 215–6). Both tried the experience in later life.

the questions which have been raised on theoretic grounds by psychologists and others.

1. *Breaking of the Taboo.*—Foremost in interest to psychologists is the basis of the body taboo. Is it a fundamental human trait, as many have maintained—inherited, or at least an inevitable consequence of man's social life? There is, for example, the curious relation of the nausea response to nystagmus and vertigo—an apparently native or early acquired association between remotely connected phenomena. Is the *shame* response to one's own nudity, or the *shock* response to the sight of nudity, a primitive response-pattern of this sort?

No one who has been through an experience of social nudity in favorable and proper circumstances will hesitate to answer this in the negative. In some cases the taboo and its customary responses slough off at once. On questioning the men stopping at Klingberg I found that for some the maladjustment lasted only a few minutes, for others it persisted during the first day—after that social nudity seemed perfectly natural and the power of the taboo was entirely broken.

I had no opportunity to find out the duration of the taboo in the women. It certainly vanished in every case after a short time. To cite an instance. An Englishman and his three daughters came one evening to the inn for admission cards to the park. The father and eldest daughter had been at Klingberg earlier in the season; the younger girls (in the late teens) had not. Next morning they all came to the gymnastic class. The two younger girls exhibited not the slightest trace of discomfort or self-consciousness,[17] although this was their first experience in social nudism.

I am unable to give any statistical data as to the duration of the body taboo in nudist surroundings. But my observations and the reports of others, make it certain that for the normal human individual who is not entirely dominated by the taboo the habitual responses disappear in a remarkably short time.

The attitude of the men and women at Klingberg cannot

[17] The untanned skin made it possible to observe the differential behavior of new arrivals.

be attributed, like the Brook Farm demonstration, to rebellion or protest against established conventions nor yet to a latent exhibitionism. The behavior of every one was natural and unconstrained. No action suggested that any one felt he was doing something unconventional or daring. Everyone seemed (like the writer) to be simply enjoying the life and making the most of this unusual experience.[18] The group was not random but it certainly was not composed to any great extent of radicals, or social rebels, or faddists. There were none whom I should class as perverts or neurotics.

2. *Shame and Modesty.*—The body taboo gives rise to two sets of responses—the reaction to exposure of one's own body and the reaction to the sight of the exposed bodies of others. *Modesty* is the reaction attending fulfillment of prevailing conventions as to body-covering; *shame* is a result of (usually inadvertently) violating these conventions; while *exhibitionism* is a deliberate defiance of the prevailing code.

At Klingberg the social code was entirely different from that of ordinary life, owing to the removal of the body taboo. The shame reactions which ordinarily accompany body exposure—blushing, shyness, labored breathing, gestures of concealment—were entirely wanting in this environment, after one had become adjusted to the new code. And there was no ground for exhibitionsim, since the entire convention of concealment had been swept away.

It would be a mistake to conclude that modesty itself disappears. But, oddly enough, there is brought about an entire reversal of the modesty concept. Attitudes and gestures which in ordinary society are indicative of modesty become highly immodest in a nudist group. Certain responses and attitudes which are traditionally immodest are now indicative of natural, ingenuous modesty.

For example: In the ordinary environment, if one is inadvertently caught naked, the natural response is a gesture to conceal some part of the body. The Moslem woman covers her face; the Occidental man or woman covers at

[18] This appears also in the photographs of nudist groups and individuals reproduced in the works cited (2–5) and in nudist magazines.

least the pubic region. This modesty reaction is typified in art by the protective gestures shown in certain statues and paintings and by the conventional fig-leaf. In a nudist park any such gesture or adornment would be distinctly immodest. I never saw the slightest suggestion of such a reaction or attitude at Klingberg. I believe that no decent man or woman would have made such a response, even involuntarily. At the morning exercises those who lived outside the park usually came wearing a bathrobe or dressing gown. Some threw this off, others kept it on till the exercises started, if the air was cool. But usually the robe was unfastened and thrown open, so that the front of the body was quite exposed. To have drawn it together when talking to one of the opposite sex would have been as immodest a gesture as the failure to do so would be in a social gathering elsewhere. In sun-bathing, men and women often lay side by side, now exposing the back to the sunlight, now at full length on the back with feet apart and arms stretched wide to get the utmost benefit from the rays. There was never an incipient gesture of concealment when others strolled by. Yet so natural was this readjustment of behavior that it passed unnoticed. Even the trained psychologist did not observe the phenomenon or appreciate its significance for several days. It has not, so far as I know, been mentioned in the literature.

3. *Shock and Diffused Attention.*—The other aspect of the taboo is its objective effect. When any tabooed part of the body is exposed, the response in the observer is *shock*. The attitude of curiosity regarding concealed parts has been called *inspectionism*, which is the counterpart of exhibitionism.

The shock experience manifests itself in various sorts of response—rapid heart-beat, disturbance of the circulatory system, blinking, turning the head, turning around or moving away, etc. Sometimes it produces motor paralysis or fascination which inhibits withdrawal temporarily. Intense shock may be accompanied by excited verbal behavior expressing disapproval, indignation, etc., which often reappears long afterwards, when the event is recalled.[19]

[19] An odd combination of inspectionism and shock has been frequently reported, in which the subject deliberately views the exposure through field glasses or by some even more labored means, and then manifests the shock behavior.

In a nudist environment the shock-response quickly disappears. And since nothing is concealed, there is no room for curiosity or inspectionism, whether natural or pathological. At the start there may be special attention to those parts of the body which are ordinarily hidden. But since the whole body is uniformly exposed, there is no focus to attract the observer's attention. Soon the effect is merely the appearance of the 'organism as a whole'; one notices the general contour of the body, whether male or female, rather than any specific sex-distinguishing features. This has been brought out clearly by the Merrills (3, pp. 42–44), and is described from the woman's standpoint by Miss Gay.[20] My own observation fully confirms their statements. Frank exposure arouses no shock in the observer, while a concealment gesture would be decidedly shocking.

In the park, clothing of obvious value (shoes, caps, etc.) was accepted in the same way as complete nudity, though certain forms of apparel might appear inappropriate.[21] Nor did the mingling of the clothed with the nude produce any feeling of shock. On reaching the beach, or before leaving, one would often stop fully clothed to chat with a group of naked persons of both sexes. An artist who was subject to sciatica wore a complete costume most of the time, and at the afternoon teas in the park there were frequently fully clothed visitors.

Only one type of experience at the park produced in me the semblance of a shock, which did not entirely disappear in the few days of my residence. This was the morning ablutions at the open-air shower. To await my turn at the pump, while a woman soaped and showered, with a final rub-down,

[20] "From my own experience, and that of habitués of nudist parks with whom I talked, I should say that this preoccupation [with sex] is not great. To be sure, the first time one enters [a gymnasium] class one is aware of other people's bodies to a considerable degree, but when one mingles all day, day after day, with naked men and women, a penis comes to be not much more unique than an elbow or a knee, and little more remarked; and the contours of one woman seem very much like those of another, save that certain of them are more shapely" (2, p. 54).

[21] I recall the surprise occasioned one day when a young man entered the water wearing a bathing cap on his closely cropped head. It transpired that he had promised his family to wear *something* when he went swimming.

and a man or two stood shaving near by, all completely nude, seemed a bit too suggestive of intimate family life. Not so the massaging of a man or woman on a table outside the park house, which usually occurred after breakfast, while the writer wrestled with psychological terminology at a table near by. Work as well as play in the nude seemed perfectly appropriate.

As regards the effect of unshapely bodies on the beholder, I am not in a position to speak. Apart from two or three men with obtrusive paunches, the park dwellers were quite well-formed. I did not find the abdominally rotund bodies any more displeasing in the flesh than in conventional attire. Doubtless the sight of a badly misshapen body or one covered with eruptions, open wounds, etc., would arouse disgust. In such cases clothing becomes a matter of utility, rather than a fetish.

4. *Eroticism.*—There remains to consider the effect of social nudity on intersex attitudes and relations. The American writers already cited are agreed that nakedness, properly pursued, is no stimulant to eroticism and has no deleterious effects on sex morality. Miss Gay mentions the case of a young man and woman, obviously in love, who kept constant company during the daytime in the park without flirting and without his ever so much as touching her body—while in the evening, when they were clothed, he would often fondle her (**2**, p. 56). The Merrills' description of the behavior of young men and women in the Koch School gymnasium at Hamburg points to the same conclusion (**3**, pp. 135–143).[21a]

During my stay at Klingberg I observed the tendency of men to seek women and chat with them in an unconstrained way. The slight sex barrier usually noticeable in social gatherings was absent; but there was no petting or flirting, no trace of ribaldry, no presumptuous behavior based on the exposure of the body. I saw and heard nothing to suggest

[21a] The subject is treated more fully in a recent work, L. C. Royer, Let's go naked (Trans. fr. French), New York, Brentano's, 1932, pp. 192. This volume, which appeared since the present article was sent to press, describes the author's experiences in several nudist resorts in Germany.

that social nudism induced the virile reflex—certainly not after the first shock at the novel situation was gone.[22]

One of my pleasantest memories is a scene one afternoon when a group of young men and girls visited the park. On one of the courts four older men and women were playing ring-tennis. Above, on a steep slope, a flight of steps with log edges led to a higher clearing. On the three top steps a dozen or more of these boys and girls were seated, side by side, watching the play and chatting together. The air was filled with shouts and laughter, as they 'kidded' one another and bandied words with the players below. There was no trace of ribaldry, no unseemly behavior called forth by the universal nudity.

Irregular sex relations may and undoubtedly sometimes do take place at nudist parks. Human nature is not transformed by putting off clothes, and there are instances of scandal at summer resorts where the usual dress conventions prevail. My observations, and the wider experience of others, lead to the conclusion that social nudism does not in any way foster eroticism—that it tends if anything to promote a saner sex outlook and more natural relations between men and women, even during the years of early sexual maturity.[23]

5. *Near-nudism and Pseudonudism.*—There is a wide difference between social nudism as practiced at the parks and gymnasiums, and the near-nudism which prevails on the modern bathing beach, in athletic contests, and on the stage. However much of the body is exposed, so long as there are prescribed limits to nakedness the taboo remains. The loin-

[22] Little information could be gathered on this point. Popular writers avoid the topic altogether. It has been suggested to me by psychologists that the reflex may be stimulated only by specific individuals of the opposite sex; also that tactual stimuli are more potent than visual.

[23] According to psychoanalysts the accidental or covert observation by children of the genitals of adults is an important factor in producing later neuroses. The problem remains whether social nudism serves to correct this tendency or accentuates it. Cf. a group of articles in *Zsch. f. psychoan. Päd.*, 1928–9, 3, 44–91. Most of these writers are inclined to believe that nudism fosters sex neuroses, and cite instances from their clinical observations. It should be noted that they come in touch professionally with the neurotic cases only—cases which might have developed in other situations as well. Their data are by no means convincing. Observation of children at the nudist park fails to show any special interest in sex anatomy.

cloth of the athlete, the brassière bathing-suit, meager though they be, denote adherence to the age-long tradition. The French colony at Villennes and similar resorts in our country recognize the taboo or are compelled to pay deference to it by legal requirements. This reduction of clothing to the minimum is in no sense social nudism so long as the taboo is expressly recognized. It remains to be determined whether the easy *camaraderie* of the nudist parks is present in such resorts, or if the wearing of some needless clothing leads to inhibitions which interfere with the full enjoyment of the bodily freedom.[24]

The display of near-nudism on the stage is a fairly new development in America. Recently, in a certain type of show, artistic posing of quasi-undraped models has come to be a recognized feature. The effect is generally pleasing; it appeals to the esthetic sense rather than to the erotic. Yet to one who has had experience in social nudism the esthetic effect is distinctly marred by the conventional brassière, however transparent, as well as by the so-called *cache-sexe*. They detract from the artistic unity of a beautiful body—like a price label on a fine painting, or a cataloguing tag on the arm of a statue.

The near-nude dances practiced on the modern stage are for the most part unesthetic. There are occasional instances, such as the fan dance in a recent revue, which meet every requirement. But in general the obvious motive is an appeal to the erotic. The strip acts of the burlesque stage are even more clearly designed to arouse sex emotion. One garment after another is removed with seductive gestures; the breasts are first coyly covered with the hands and then partly revealed. The motive is obviously to focus attention on those parts which are conventionally proscribed and to arouse erotic feelings. This pseudonudism is a form of visual ribaldry. It is either sheer exhibitionism or a catering to in-

[24] Considered from the hygienic standpoint, there is some evidence of a healthful effect of sunlight on the gonads, which is not obtained where any sort of loin-cloth is worn. I am informed by one who had previously spent some time at Villennes, that he "derived much benefit [at Klingberg] in the parts covered by a slip [at the French resort]—most notably in the strengthening of the testicles."

spectionism. In contrast with such displays, the matter-of-fact disrobing of men and women together at Klingberg and in the nudist gymnasiums is entirely lacking in sex significance to the beholder, and arouses no more erotic feeling than taking off a cloak or an overcoat at a party.

The difference between near-nudism and nudism, one concludes, lies in the presence or absence of the body taboo. Even though the prohibited zones have become more and more restricted, the fundamental concept of taboo remains and influences our behavior and attitudes. Social conventions reinforce this notion and raise it to the level of a moral principle. Any contravention becomes indecent and exhibitionistic. The most striking phenomenon in the life at a nudist park is that this taboo disappears almost at once, and without any detrimental effect to one's world-view or morals. One quickly realizes that the human body is *not* indecent. This conclusion may not be consciously formulated—in most cases it probably is not. But its implicit acceptance is shown in every act and phase of behavior.

6. *Community Nudism.*—It would be faulty logic to generalize from my limited experience, even though supplemented by the more extensive observations that others have reported. One cannot easily determine whether breaking the traditional taboo would be feasible or beneficial to the community at large. The group at Klingberg is not a random sampling. Those who come to the park have usually gone beyond the average person in challenging the body taboo; and careful examination of motives by the owner of the park serves to weed out those who are drawn hither by idle curiosity or with prurient intent. In the nudist gymnastic clubs in Germany a similar selective process occurs. And the bands of youths (Wandervögel), who roam about Germany and frequently indulge openly in nude bathing are less permeated with traditional restrictions than the older generation. The evidence is therefore not conclusive. A crucial test might be to introduce a prudish spinster or an officer of some anti-vice society into one of the nudist centers. If their ethical attitude were the result of a pathological nature the experience might

lead to a nervous breakdown. Given a normal individual, one could observe whether the shock experience persisted in full intensity or gradually diasppeared. It would be enlightening also to test the effect of a sane nudist life upon youths accustomed to treat the body and its functions in a spirit of ribaldry. In the absence of such evidence it is impossible to reach universal conclusions. I have simply described observed facts and drawn what appear to be legitimate inferences.

Two conclusions of considerable psychological importance were satisfactorily established: (1) Since the traditional body-taboo can be readily, almost immediately broken without detrimental results, it is not a fundamental human trait. (2) Social nudity is not in itself indecent; only a widespread and persistent social convention has made it so.

V. Summary

A brief historical review indicated that among civilized races and savages clothing has been adopted to a great extent for body concealment as well as for protection or adornment. In some races this body taboo has been *familial;* under Christian influences it has come to be largely *intersexual;* in Anglo-Saxon lands it has risen to the level of a moral principle.

Recently there has been a growing tendency to discard superfluous clothing and to limit the taboo to a few sexually distinctive parts of the body. This has resulted in modifying the taboo, but not in abolishing it. In the last few years the practice of sun-bathing has weakened the taboo; but since the sexes are segregated in America, the intersexual restriction still persists. The nudist movement in Germany is a real challenge to the body taboo.

The attitude of the writer's friends and acquaintances toward *social nudism* is reported, and the opinions of psychologists in reply to a questionary are cited. All these opinions were found to be based on theoretic grounds and not on personal experience.

The writer spent a week at a nudist park in Germany and describes his experiences and observations. The data gath-

ered, supported by findings of earlier writers, led to the following conclusions regarding the psychological effects of social nudism:

1. On coming into contact with a nudist group, the subjective experience of *shame* and the objective experience of *shock* tend to disappear at once or after a short time, so far as could be observed.

2. Where complete exposure of the body, except for protection from sun, rough soil, etc., is the universal practice in a group, there is no embarrassment or self-consciousness due to one's own nudity. The modesty attitude does not vanish along with the taboo, but its manifestations are almost diametrically reversed. Any gesture of concealment becomes an attribute of immodesty. Such gestures or attitudes were never observed; they would be socially discountenanced.

3. Where the entire group are unclothed, the sight of the naked body ceases to arouse curiosity. Nudity is accepted as a natural condition. Since there is nothing to focus the attention on any specific part, one has merely the impression of the body as a whole, and sex differentiæ no longer possess special significance.

4. The writer's observations and the testimony of others indicate that social nudity is not productive of eroticism. There is less sexual excitement, less tendency to flirt, less temptation to ribaldry, in a nudist gathering than in a group or pair of fully clothed young people.

5. The taboo is present so long as any part of the body is covered, not for protection but for concealment. This distinguishes genuine nudism from the near-nudism of athletics and the pseudonudism of the stage.

6. It is not clear from the data at hand whether the practice of nudism could be applied with advantage to the community at large.

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PSYCHOLOGY OF FEELINGS AND EMOTIONS. II. THEORY OF EMOTIONS

BY HARRY F. HARLOW AND ROSS STAGNER
University of Wisconsin

As we have pointed out in a previous paper (9), the existence of feelings as distinct and discrete psychophysiological entities can hardly be questioned, since there is abundant evidence to show that they exist as independent conscious experiences and that they are attended by characteristic reaction patterns. These elementary affective states are four in number: pleasantness, unpleasantness, excitement and depression.

The nature and organization of pleasantness and unpleasantness has been clearly shown by the work of Head and Holmes (10), and although described in terms of conscious experience, the control of the stimuli eliciting these 'verbal reports' is so exact as to satisfy the strictest behaviorist. In spite of the fact that it is not possible to present such clear and unequivocal evidence concerning the existence of the elementary feelings of excitement and depression, many observations cited in our earlier paper indicate the fundamental status of this second pair of affective qualities.[1]

There is also evidence from many sources to indicate that these four elementary feelings are attended by characteristic reaction patterns. By this term we do not mean that all pleasurable stimuli will invariably elicit the same response in a particular muscle or muscle-group, or that a single kind of affective stimulus will invariably produce the same reflex response at different times. Even an elementary knowledge of the functioning of the neuromuscular system should convince one of the logical absurdity of this. The simplest

[1] The evidence for excitement as an 'undifferentiated emotion,' as presented by Stratton, Excitement as an undifferentiated emotion (Wittenberg Symposium on Feelings and Emotions), may be interpreted as showing the occurrence of a pure 'feeling of excitement.'

skeletal motor reaction is produced by the synergic activity of muscle groups controlled and regulated by the condition of many higher centers (red nucleus, corpora striata, cerebellum and cortex), each of which is probably subject to temporal variation and is unequally affected by identical stimuli at various times.[2] Skeletal motor responses, therefore, induced by mental states should not exhibit a high degree of uniformity and similarity in the individual reflex elements of the response, but should show only a certain 'functional' unity.

It is the attempt of the present paper to bring order out of the chaos existing in affective psychology by an application of these conceptions to the psychology of emotions.

I. Previous Theories of Emotions

Theories of emotions which have previously been advanced differ on three fundamental problems: (1) the nature of the conscious processes that go to make up an emotion; (2) the anatomical localization of the centers for feelings and emotions; and (3) the number and nature of innate emotions and their subsequent modification.

(1) The theories concerning the nature of the conscious processes that go to make up an emotion range from the original formulations by James (**12**) and Lange (**16**) who hold that an emotion is nothing more than a particular pattern of organic and kinesthetic sensations to those such as given by Wundt (**32**), who believed that an emotion was only a pattern of feelings—"where . . . a series of feelings succeeding one another in time unite to an interconnected process . . . we call the unitary succession of feelings an emotion." Intermediate between these extreme views are those which admit that both of these processes are involved. Thus Titchener (**28**) emphasizes the importance of the feelings although admitting that organic sensations may play some part. James

[2] Evidence bearing on this point may be obtained from the studies of Lashley, Temporal variations in the function of the gyrus precentralis in primates, *Amer. J. Physiol.*, 1923, 65, 585–602, and from Sherrington's studies of the reversibility of response to cortical stimulation subsequent to the development of tetanus, in Integrative action of the nervous system, pp. 293–299.

(13) in his later reformulations took an opposite point of view, admitting that there is a basic feeling tone but still over-emphasizing the importance of the sensory pattern.

The clearest formulations of this 'mixed' view have been made by Allport (1) and Tolman (29). These writers hold to the very rational opinion that there are feelings, pleasantness and unpleasantness, which give a characteristic tone to all emotions. For both of these writers the 'differentiating factors' of specific emotional experiences are kinesthetic sensations resulting from a particular body set.

Cannon's position in this regard cannot be stated, as for him an emotion is an emotion, an introspective datum which is apparently unanalyzable (5). The same view has been held by many psychologists, *e.g.*, Stout (26), who holds that there are introspective differentiæ for each emotion, apparently innate and irreducible.

(2) Few of the authors of theories of feelings and emotions have been willing to commit themselves on the anatomical localization for the various affective processes. The ascribed and implied cerebral localization for these various theories, however, differs.

James properly located the organic and kinesthetic sensations which were supposed to *be* the emotion in the somesthetic area of the cortex. In his reformulations, he did not localize the feelings which were added. Had the knowledge of thalamic functioning been as extensive then as now, James might well have located these processes there, for in discussing emotions he clearly recognized the possibility that "separate and special centers, affected to them alone . . . [might be] their brain seat." Wundt and Titchener seem to imply that the cortex is the seat of all conscious processes and therefore the seat of the patterns of feelings that comprise an emotion. There is nothing in their point of view, however, that necessarily assigns these processes to the cortex rather than to any other cerebral center.

The position of Allport and Tolman is very similar to that of James. Though they do not ascribe the feelings of the differentiating kinesthetic sensations to any cerebral center,

the cortex is necessarily implied. Although both of these psychologists recognize the feelings as elements in the emotional response, they both assume that the feelings result from *visceral sensations* and therefore must locate the center for the feelings in the cortex.

Both Dana (**6**) and Cannon state that the emotions are a result of 'action and interaction of the cortex and the thalamus.' Dana has attempted no further analysis of the part played by each of these two cerebral centers. Cannon, it would seem, is unwilling to admit that the subcortical centers have anything to do with consciousness. Instead, the emotional stimuli set up a pattern in the thalamus which in turn sends up impulses to the cortex, where they are experienced as a conscious state of emotion. Thus, although the thalamus is essential for the feeling, it is not, according to Cannon, the primary projection center for these conscious states. This, we may note, is a revival of the earlier theory of Sergi (**22**), who suggested that the brain stem is the seat of the affective process and the function of the cortex is in rendering this conscious.

This point of view is opposed to that of the English school. who unhesitatingly ascribe the affective qualities of pleasantness and unpleasantnes to the thalamus, and assume that this center is solely responsible for their origin. Chief among these researchers are Head and Holmes (**10**) and Stopford (**25**).

(3) The theoretical positions on the number and nature of innate emotions are also varied, from Dashiell (**7**) and Sherman (**23**) who cast doubt upon the existence of any innate emotional responses, through Watson (**30**) with three, and up to McDougall (**17**) with fourteen. The subsequent modification has been considered as frank conditioning, as maturational effect or as compounding of complex from simple emotional states.

II. Previous Theories of the Acquisition of Emotional Responses

Dashiell (**7**) suggests two theoretical attitudes (others are also possible) toward the problem of inheritance of emotional responses:

One is that there *are* emotions corresponding to the different conventional names, but that the visceral core of each remains yet to be discovered.

A very different assumption suggested is that such names as are conventionally used for different emotions refer to different types of viscerally facilitated or inhibited overt *behavior* patterns that have been classified and labeled more in terms of their *social* significance than in terms of their *visceral* components.

He then suggests that visceral patterns reinforcing and facilitating the overt behavior of the individual are *acquired*, and since the control of the viscera by enviornmental stimulation is quite indirect, the pattern acquired by a given individual will bear little or no relation to that of others.

Two points argue against this view: (1) even the overt behavior manifested by an individual in emotional situations is quite inconsistent and lacking in uniformity (Landis (15) on facial expressions) and (2) the visceral and overt patterns manifested by an individual when he reported the *same* emotion were not consistent. (Landis, Brunswick (4) on visceral tone.) Since the subjects of Landis' experiments could not identify their emotions from their own photographs, it seems quite unlikely that even social behavior in emotions is consistent enough to be a basis for naming emotions.

Sherman (23) writes as follows in discussing the genesis of emotional reactions:

The reactions are at first generalized, but even in the earliest responses two types of reactions are noted: (1) that of rejecting the stimulus, and (2) that of accepting the stimulating condition. . . . The emotional activity which serves to reject the stimulating condition may be further classified into the two following types: (1) the rejection of the stimulus by retreat, and (2) rejection of the stimulus by aggressive activity. . . . The emotions of an adult are usually differentiated not by the peculiar organic activity involved, nor by any specific facial expression, but only on the basis of the differences in the adjustment of the body in relation to the stimulating condition.

As good behaviorists, neither Dashiell nor Sherman have

made any effort to explain the conscious concomitants of emotions. Neither have they offered any reason for these native segments of behavior which most manifestly do occur (the rejecting and accepting responses of Sherman, the visceral facilitating and inhibiting factors of Dashiell). Therefore, these theories are lacking in completeness.

Tolman's position (**29**) concerning the differentiation of emotional responses appears more precise and plausible than any of the other theories so far presented. He believes that "the emotions are distinguished and given separate names by virtue of (1) the differences between the final physiological quiescences and disturbances which they are respectively seeking and avoiding, and by virtue of (2) the characteristic differences of means-end-relation in which they expect these respective quiescences and disturbances to lie. . . . We define the emotion as fear, whether it be in ourselves or in rats, when the organism is observed to run or hide; we define it as rage, when he is observed to fight or attack; we define it as lust, when he is observed to caress or copulate. And these distinctions we make quite successfully, irrespective of whether or not the visceral components, and hence the introspective feels of these different emotions, are or are not distinctive. . . . In the last analysis, each emotion, as a distinctive entity . . . is to be defined . . . in terms of the process's functional character."

The anatomical and physiological concomitants of the activities referred to by Tolman are vague and undefined, and it is difficult or impossible to determine the unconditioned responses upon which the conditioned emotional response must have been formed.

III. A Proposed Theory of Emotions

So far in this paper we have pointed out the controversial points in the various earlier theories, and have suggested certain difficulties that these earlier theories have encountered.

The theory which we wish to advance is to the effect that: unconditioned affective responses form a basis for the emotions (these affective patterns being describable in terms of

conscious feelings, induced by activation of sensory thalamic projection centers, and by reaction patterns controlled by diencephalic motor nuclei); and that emotions themselves are conditioned responses subsequently formed. The conditioning processes by which all *emotions* are acquired, modify the unconditioned affective pattern by enormously extending the range of stimuli that will elicit it, and usually by 'damping' the violence of the unconditioned affective response.

Such a theory may be employed effectively in discussing the three fundamental controversial problems of the emotions without doing great violence to the body of introspective, pathological and experimental evidence that is now at our disposal. The discussion may be given point by point as follows:

(1) The fundamental conscious emotional states are feelings (Titchener (28), Wundt (32), James (13), Allport (1), and Tolman (28)), but since a specific emotion is a psychological unit of greater magnitude than a feeling, other conscious states may be represented, viz., consciousness of the stimulus (James (13), Tolman (29), and even Watson (30), who emphasizes the stimulus if denying consciousness) and also consciousness of the bodily changes (James (12), Lange (16), Sergi (22), Allport (1), and Mott (19)). Since, according to the Gestalt and the 'common-sense' point of view, the part played by the various physiological processes is not discriminated (in the *intact* person), the various emotional states may each appear as consciously different and unanalyzable unities (Irons (11), Stumpf (27), Stout (26), Krueger (14), and Cannon (5)).

(2) The feelings are localized in the thalamus, while sensations (as perception of stimuli and bodily responses) are localized in the cortex. This conception, and this conception only, accords with the neurological findings of Roussy (21), Head and Holmes (10), Goltz (8), de Barenne (3), Dana (6), Wilson (31), and Bard (2), and the physiological studies of Sherrington (24), Cannon (5), and Maranon (18).

(3) The problem concerning the number and nature of the innate emotions and the manner of their subsequent

modification is also well explained by this theory. As suggested by Dashiell and Sherman, there are no innate emotions. The advantage of our theory, however, is that *it suggests a group of unconditioned responses as a basis from which emotions may develop.* Although the number of emotions, *i.e.*, specific conditioned affective stimuli, is without limit, we agree with Tolman and Allport, that certain fundamental emotional classes are delimited by the underlying feelings.

The innate components of the emotional experience are the four fundamental feeling-tones, pleasure, unpleasantness, excitement and depression. These feelings represent the only identifiable conscious elements in an emotion, aside from sensations and cognition of the stimulating situation; and they furnish a basis for such uniformity as has been observed in the reflex expression of emotions, in their discharge through diencephalic motor centers.

Emotions, however, may easily be distinguished from feelings in that the emotion is characterized by *cognition* of the external situation. The individual must not only *feel*, but he must feel with relation to some known stimulus.[3] If we feel excited without knowing why, we report no emotion, but if we feel excited in a situation calling for attack, we report 'rage.' From this point of view it is obviously impossible that an infant at birth could have 'emotions,' although it would manifest the reflex responses appropriate to the feelings.

The problem still remains as to the differentiation of specific emotions from the diffuse mass of feeling-sensations which represent the innate response to the emotionalizing stimulus. If two emotions are both unpleasant and exciting, by what criteria do we decide that one is fear and another is rage?

In the first place, it is quite clear that the conscious experiences of fear and rage may be quite similar. Ample introspective evidence supports this statement. This similarity

[3] This fact explains the results of experiments on adrenalin, in which the subjects reported feeling 'as if afraid,' etc. Visceral changes set up neural impulses which stimulate the thalamus, activating feeling-centers. There is present, however, no cognition of a stimulating object to which the feeling-tone may be attached. Hence the complete emotion is lacking.

is obviously due to the presence of the same fundamental feeling-tones in the two situations. The reflex manifestations will also be similar, since the physiological processes activated will be so nearly the same. It seems probable, then, that the verbal designations applied to specific emotional experiences, as fear, rage, love, etc., are determined purely and simply by cognition of the external stimulus and its meaning. A man chased by Indians, caught and tied to a stake may experience successively fear and rage, without any change in either conscious or reflex responses other than those determined by specific environmental stimuli.

The sequence of events in an emotional experience, as they may be schematized on this theory, is shown in Fig. 1. An external stimulus (*S*) affects a sense-organ (*SO*). The afferent impulse passes to the thalamus (*T*) and activates centers there

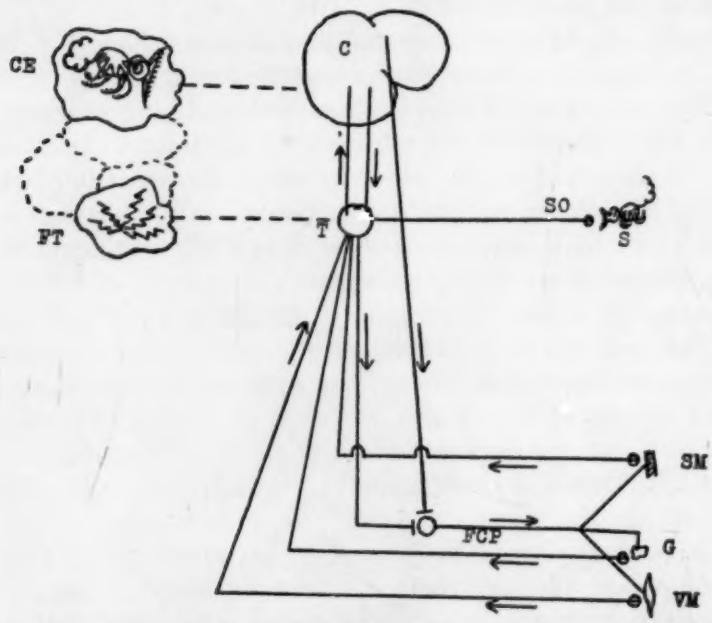

FIG. 1. As explained in the text, the 'frightful object' stimulates a sense-organ (*SO*), from which impulses pass to the thalamus (*T*), arousing unpleasant feeling-tone, indicated by lightning in the cloud at the reader's left. The impulses also pass to the cortex (*C*), arousing a perception (*CE*) in which the stimulus is magnified. Efferent impulses pass by various tracts to the final common path, cause responses in the effectors and return afferents to thalamus and cortex.

which furnish the fundamental feeling-tone of the experience (*FT*), shown in the clouds to the reader's left. The impulse is simultaneously relayed to the cortex, (*C*), where it arouses a cognitive experience (*CE*) the meaning of the stimulating situation. As shown by the dotted clouds, the conscious experience is fused and unitary. From the thalamus reflex connections arouse responses in the effectors, both skeletal (*SM*) and visceral (*VM*), while from the cortex impulses are sent to the lower coordination centers, bringing about modifications in and directing, the original reflex responses, and bringing into service learned manual and verbal responses, etc. Proprioceptive and interoceptive impulses then return to the thalamus and cortex, and impart their quality to the total experience, as well as reinforcing the feeling-tone and the overt responses directed toward the object.

It thus appears that the specific name attached to an affective response must be largely a matter of social conditioning. There is nothing about 'rage' as such, that entitled it to a specific name. Descriptively, rage is a state of unpleasant excitement in a situation calling for attack. If the situation calls for retreat, the emotion is known as fear.

Such a theory as this is required by the evidence from pathological cases. Individuals in whom the reflex 'expression' of an emotion occurred independently of the emotional experience as introspectively reported have always represented a problem in emotional theory. They made impossible any formulation in terms of which the afferent stimuli from the response make up the emotion, just as they interfered with any interpretation of the response as the result of the emotion. The main source of error has been the failure to recognize the emotion as a derived experience, or at least as a complex of simpler components. The possibility that the conscious processes and the motor responses of the normal emotional experience might be functionally a unit but pathologically dissociable depends upon the recognition of affective responses as distinct from emotions proper.

Our theory is likewise supported by the observations of Watson (**30**), Sherman (**23**), and Pratt, Nelson and Sun (**20**)

on the affective reactions of infants. The observable changes which occur are more appropriately describable as responses to exciting, unpleasant or unpleasant stimuli than as specific emotions. The lack of uniformity found with very young infants emphasizes the importance of learning.

Summary

The unconditioned components of affective experience are the four fundamental feeling-tones of pleasantness, unpleasantness, excitement and depression. These are associated with projection centers in the thalamus and have reflex connections with various subcortical motor centers.

Emotions (considered as specific emotional experiences) are not innate, but develop as a result of learning. An emotional response includes the fundamental feeling-tone aroused by the sensory stimuli, and the cognizance of the stimulating situation. Differentiation of specific emotions is to be considered not as a matter of different motor components, but simply as differences in the conscious attitude taken toward the stimulus. The occurrence of a motor response is not essential to an emotional experience, and in pathological cases the conscious and reflex components of the pattern may become dissociated.

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RELATIVE VALUES OF THE VOCABULARY TERMS OF GENERAL PSYCHOLOGY

BY MILTON B. JENSEN

Western Kentucky State Teachers College

Insuring that *bona fide* psychology be made available to the student in the elementary course is one of the paramount needs of psychology. That this is sensed by leaders in the field is evidenced by the work of the Midwestern Psychological Association's committee on the elementary course and by Professor Warren's work in the building of a psychological dictionary. That most students who enroll in the elementary course in psychology have little opportunity for acquaintance with psychology as it is, or as it is becoming, is shown by Peterson.[1] Concluding an analysis of the situation he says:

> *One of the greatest* problems of psychologists today is to have real psychologists introduced into the teacher-training colleges where their services are almost unappreciated, probably because the administrators themselves have had no vital connection with research work in psychology and do not appreciate what better psychologists would mean to their students.

The teacher of psychology in many institutions, especially in teachers colleges and normal schools, is, in addition to being untrained in psychology with a consequent incapacity for proper evaluation of text-books and teaching materials, intellectually indolent, if not indigent. For this teacher, already in the field and not likely to be dislodged, it is imperative that psychology supply more adequate tools—texts, references, etc. The following evaluation and analysis of the vocabulary of the elementary field, will, it is hoped, provoke further and more effective work towards this end.

[1] J. Peterson, Training and equipment of teachers of educational psychology. Chapter X in The direct contributions of educational psychology to teacher training. 1932 Yearbook Number XX of the National Society of College Teachers of Education.

The present study is concerned with analysis and evaluation of the vocabulary of the following nine elementary psychology texts and one book of readings:

Breeze, B. B., Psychology, Scribners, 1921.
Carr, H. A., Psychology, A Study of Mental Activity, Longmans, 1925.
Dashiell, J. F., Fundamentals of Objective Psychology, Houghton Mifflin, 1928.
Gates, A. I., Elementary Psychology, Macmillans, 1931.
Griffith, C. R., General Introduction to Psychology, Macmillans, 1928.
Perrin, F. A. C. & Klein, D. B., Psychology, Its Methods and Principles, Henry Holt, 1926.
Pillsbury, W. B., The Essentials of Psychology, Third Edition, Macmillans, 1930.
Robinson, E. S. & Robinson, F. R., Readings in General Psychology, University of Chicago Press, 1923.
Warren, H. C. & Carmichael, L., Elements of Human Psychology, Revised and Enlarged Edition, Houghton Mifflin, 1930.
Woodworth, R. W., Psychology, Revised Edition, Henry Holt, 1929.

All terms from the indices of these books (duplications excluded) were listed. Words having, in the opinion of the present writer, no possible psychological meaning were eliminated, leaving 403 terms. Each of these 403 terms was rated as to its value to the field of general psychology by 15 psychologists representing as many departments. The following hypotheses relative to the nature of language were set down for the guidance of the judges:

I. The value of language may be measured in terms of its facilitation of thought processes and of their transference, by which is meant non-verbal as well as verbalized language, though this study is concerned only with the latter.

II. Verbalized language is of two types separated by ever-changing boundaries:

a. General.—Used in many or all fields as representative of the same or nearly the same thought processes. And, from, to etc. are examples.

b. Singular.—Representative of thought processes peculiar

to a particular field. The possession of verbalized concepts of this *singular* nature separates one science from another.

Professor Carr, in a letter to the writer (May 27, 1931), explains his understanding of the difference between these two types of terms as follows:

> I have omitted a number of words like 'abnormal' and 'acquisition,' which are popular terms and hardly need any extended treatment in order to develop and define their meaning, any more than a teacher of psychology should stop to define the usage of such terms as 'but' and 'and' and 'take,' et cetera.

It should be noted that the same term may have both a *general* and a *singular* usage. *Accommodation*, for example, to the general public and to psychology in a *singular* sense is representative of very different thought processes.

III. The value of any term to psychology as a science can be measured best in terms of what psychologists think of its *singular* contribution to psychology. Frequency of usage, difficulty of definition and complexity in an etiological sense are not satisfactory measures of these values.

It was intended that the ratings of these terms should be representative of opinion from many major institutions and from different sections of the country. For the most part coöperation was secured by personal solicitation. I am deeply grateful to those assisting with the study, particularly to Professor Carr who gave many timely suggestions relative to methods of procedure. I am also indebted to many of those who found themselves unable to comply with the requests for assistance. Several of them wrote in a very instructive manner relative to the problem. Ratings were asked of the departments listed in Table I.

Considerable difficulty was experienced by the raters in using the above scale. Practically all expressed dissatisfaction with their own ratings. Much of this difficulty was due to lack of clarity in the instructions given the judges. Some of it seems to be inherent in the problem. Professor Carr writes (May 27, 1931):

There are two phases—the word symbol itself and the notion which it symbolizes. The first question is, do we rate as to the appropriateness of the word, as opposed to the notion that the word symbolizes? This question would involve the matter of terminology or choice of words. For example, I never use the term 'action pattern' myself.

Second, sometimes the notion is known, but the word symbol is unknown, and it is necessary to teach the word because it is used so much. Amnesia may be cited for an example. Some students do not know what this word means, although they would understand the concept stated in other words. It would be necessary in this case to define or expound the meaning of this term. Here we are teaching the word, rather than the concept.

Third, the question may arise as to whether the concept denoted by the word should be employed. And, fourth, there arises the question as to whether the notion or meaning of the word, should be defined and developed. There is then the problem as to whether it is necessary to define the meaning of the term.

Since the above points were not all clearly defined in instructions to the judges, just what they considered in making the evaluations may not be assumed. They were instructed to "rate with respect to the *singular* value of the term to the field of general psychology." Had they been given more explicit instructions there would, in all probability, have been greater agreement between their ratings.

TABLE I

INSTITUTIONS FROM WHOSE PSYCHOLOGY DEPARTMENTS RATINGS WERE SOUGHT
(* indicates from which departments ratings were received)

*Brown University	University of California
*Columbia University	*University of Illinois
*George Peabody College	*University of Indiana
George Washington University	University of Iowa
*Harvard University	University of Kansas
Johns Hopkins University	University of Michigan
McGill University	*University of Missouri
*Northwestern University	University of Minnesota
*Ohio State University	*University of North Carolina
Princeton University	*University of Oregon
*Smith College	*University of Texas
*Stanford University	University of Toronto
*University of Arkansas	Yale University

TABLE II

PSYCHOLOGISTS PROVIDING RATINGS FROM THE VARIOUS DEPARTMENTS

W. F. Book (Indiana)
E. G. Boring (Harvard)
Leonard Carmichael (Brown)
H. A. Carr (Chicago)
H. B. English (Ohio State)
J. F. Dashiell (North Carolina)
P. R. Farnsworth (Stanford)
A. R. Gilliland (Northwestern)
Joseph Peterson (George Peabody)
R. H. Seashore (Oregon)
W. S. Taylor (Smith)
R. H. Waters (Arkansas)
R. S. Woodworth (Columbia)

The scale employed by the judges in making the ratings was:

10 = Maximum *singular* value of any term to psychology,
0 = Worthless,
— 10 = Maximum negative *singular* value of any term to psychology—leading away from psychology into some other field.

Some of the judges experienced difficulty in determining what group to consider in evaluating. They differentiated between 'value to the field of general psychology' and 'value to a particular group concerned with psychology.' Professor Terman writes (Nov. 4, 1931):

If you mean how important are these words for the prospective elementary school teacher taking her psychological training, that is one thing; if you refer to university students majoring in psychology for the A.B., that is another; if you mean graduate students in psychology preparing for teaching or research in the subject, that is still another matter.

Professor Farnsworth, who supplied the ratings from Stanford, says:

I rated these on the basis of my ideas of culture, *i.e.*, what I try to give in Psychology 51 (the beginning course at Stanford) to improve the cultural background of the general run of Stanford Students. These ratings do not apply to psychology majors.

Additional difficulties were experienced by certain of the judges because of the terms standing alone rather than in context. Relative to this Professor Dunlap writes (Oct. 29, 1931):

There are some terms which are thoroughly indefinite as given, for example, irritability, dispersion, and indices. Each of these

terms may mean most anything when used alone; but with the proper context or adjective may become sharply precise.

Apparently this is something of what Professor Boring has in mind when he says (Oct. 26, 1931):

> We need, I think . . . psychologists who can use the English language univocally rather than persons who depend upon the fixed meaning of a word or phrase. I should not, you see, try to avoid present ambiguities by settling rigid definitions upon words, but rather by letting the psychologists learn how to write.

From the above it is evident that 'value to the field of general psychology' may not be thought of as an unitary concept, idea or notion to many, if to any of the psychologists assisting with this study. It may be said, however, that ratings such as these have in them certain stable elements which should be of distinct value to psychology. While it is statistically and empirically evident that 'value' as herein employed does not mean the same thing all the time to all the judges, even if it may, which is doubtful, mean the same thing to any individual judge at all times, yet there is enough agreement that their judgments may be thought of as having distinct psychological merit.

The average of the intercorrelations of the judges' ratings of the 403 terms is .240 ± .03. What shall this be thought of as measuring? Is it an indication of the degree to which the judges agree as to the meaning of 'value,' or is it descriptive of the average degree of accuracy with which they give ratings in terms of value as defined? If the latter, their combined judgments (by use of the Spearman-Brown formula) possess an estimated reliability of .825 ± .01, a very satisfactory degree of accuracy for data of this type. A safer interpretation is that the intercorrelations of the judges ratings are affected by both elements: the extent to which the judges use the same criteria of 'value' and the accuracy with which they give their ratings, using the same or different viewpoints as to the nature of 'value.' If, as is evident, there is lack of perfect agreement as to the nature of 'value,' the average of the intercorrelations is an inadequate (spuriously

low) measure of the accuracy of their ratings. If, as is always the case with data of this type, there are inaccuracies of judgment, these inaccuracies produce a distorted picture of the actual agreement between the judges. In any case, then, the average intercorrelation of the ratings (.240) is a spuriously low indication, either of the average agreement of the judges as to the nature of 'value,' or of the average reliability of their ratings. A thorough understanding of this problem must await further analysis. An application of the tetrad equation to the 110 intercorrelations would give more exact information as to the nature of the ratings.

The means and standard deviations of the ratings of the fifteen judges are given in Table III. Marked variability is present in both sets of data. Here, it will be noted, there is no definite relation between the magnitude of the mean rating and the extent of variability: the rank-order correlation is $-.06 \pm .17$.

TABLE III

MEANS AND STANDARD DEVIATIONS OF THE RATINGS OF THE JUDGES

Judge	Mean	Standard Deviation
Book	6.16	4.36
Boring	5.53	3.76
Carmichael	9.83	1.28
Carr	3.13	3.11
Dashiell	7.67	3.37
English	6.90	2.63
Farnsworth	5.64	3.29
Gilliland	6.46	1.61
McGeoch	8.03	2.87
Perrin	7.24	3.43
Peterson	6.52	3.35
Seashore	7.10	3.93
Taylor	8.49	3.58
Waters	4.23	2.60
Woodworth	7.06	2.56

Table IV gives the 403 terms arranged in order of mean rating as to *singular* value to the field of general psychology. The mean rating and its standard deviation (σ_M) are given. The wide range of ratings will be noted. With 10 as the highest rating possible, *stimulus* receives 9.47 and *perceptor* .27 (0 is worthless). In general, the higher the rating given a word, the greater the agreement of the judges as to its value. The product-moment correlation between mean rating and

TABLE IV

403 TERMS ARRANGED IN ORDER OF VALUE TO THE FIELD OF GENERAL PSYCHOLOGY

(10 is the maximum *singular* value possible; 0 is worthless. The mean values and their standard deviations were determined from the ratings of the 15 psychologists listed in Table II.)

Mean	σM	Term	Mean	σM	Term
9.47	.36	stimulus	8.33	.67	mental age
9.40	.28	recall	8.33	.86	nerve
9.33	.31	coef. of correlation	8.33	.76	neurone
9.20	.28	conditioned reflex	8.33	.62	pain spot
9.20	.38	illusion	8.27	.69	hypnosis
9.13	.41	cortex	8.27	.66	hysteria
9.13	.51	experiment	8.27	.61	motor coördination
9.13	.40	learning curve	8.27	.85	reflex
9.07	.44	mean	8.27	.53	retina
9.07	.34	perception	8.27	.87	thinking
9.00	.43	central tendency	8.20	.61	autonomic
9.00	.45	cerebrum	8.20	.69	cerebellum
9.00	.71	individual differences	8.20	.72	controlled association
9.00	.44	kinesthetic	8.20	.95	hearing
8.93	.71	nervous system	8.20	.65	ideational process
8.87	.57	afferent	8.20	.80	fissure of Rolando
8.80	.46	image	8.13	.34	after image
8.80	.52	James-Lange theory	8.13	.63	amnesia
8.80	.49	median	8.13	.56	average deviation
8.80	.72	stimulation	8.13	.66	axon
8.73	.63	distribution curve	8.13	.82	behavior
8.73	.49	motivation	8.13	.79	cones
8.67	.49	complementary colors	8.13	.59	gestalt
8.67	.75	effector	8.13	.65	innervation
8.67	.49	efferent	8.13	.87	intensity
8.67	.41	integration	8.13	.62	plateau
8.67	.48	memory	8.13	.64	reliability
8.67	.75	norm	8.13	.80	threshold
8.67	.80	reaction	8.07	1.09	blind spot
8.67	.56	Weber's law	8.07	.64	delusion
8.60	.75	average	8.07	.59	facilitation
8.60	.42	color blindness	8.07	.63	rods
8.60	.58	endocrine glands	8.07	.49	rote memory
8.60	.76	olfactory	8.07	.66	stereoscope
8.60	.45	retention	8.07	.76	Young-Helmholtz theory
8.53	.53	Binet tests	8.00	.39	adaptation
8.53	.72	conductivity	8.00	.73	discrimination
8.53	.75	delayed reaction	8.00	.74	fovea
8.53	.47	free association	8.00	.78	hallucination
8.53	.56	imagination	8.00	.73	hemisphere
8.53	.53	normal curve	8.00	.80	intelligence
8.53	.56	trial-and-error method	8.00	.63	overtone
8.47	.55	basilar membrane	8.00	.65	probable error
8.47	.64	dendrite	8.00	.75	static sense
8.47	.63	Ladd-Franklin theory	7.93	.68	attention
8.47	.81	response	7.93	.74	brightness series
8.47	.61	variability	7.93	.60	habit
8.40	.64	binocular	7.93	.66	spinal cord
8.40	.71	cochlea	7.93	.73	synapse
8.40	.74	hypothesis	7.93	.56	timbre
8.33	.77	cutaneous	7.93	.73	whole-&-part learning
8.33	.58	intelligence quotient	7.87	.67	introspection
8.33	.79	learning	7.87	.83	pitch

TABLE IV—*Continued*

Mean	σM	Term	Mean	σM	Term
7.87	1.03	psychotherapy	7.27	.60	abstraction
7.87	.85	standard deviation	7.27	.84	cretinism
7.87	.78	tones	7.27	1.03	dreams
7.80	.77	adrenalin	7.27	.88	excitation
7.80	.67	concept	7.27	.84	wave length
7.80	.82	contiguity	7.20	.89	analgesia
7.80	.52	drive	7.20	.78	anthropomorphism
7.80	.84	heredity	7.20	1.00	development
7.80	.57	memory span	7.20	.83	environment
7.80	.82	proprioceptor	7.20	.97	fear
7.80	.83	sensation	7.20	.83	gustatory sensation
7.80	.57	spectral colors	7.20	.84	hormones
7.80	.79	thalamus	7.20	.84	rationalization
7.73	.87	maze	7.20	.95	recency
7.73	.76	psychoanalysis	7.20	.81	sensorimotor
7.73	.62	recognition	7.20	.80	simple reaction
7.73	.65	taste	7.20	.67	tropism
7.67	.59	eidetic	7.13	.87	achievement
7.67	.74	optic nerve	7.13	.79	ambiguous figure
7.67	.47	paranoia	7.13	.66	color blend
7.67	.75	psychopathic	7.13	1.01	organ of corti
7.67	.71	rank order	7.13	.69	dissociation
7.67	.77	semicircular canals	7.13	.88	ganglion
7.60	.95	emotion	7.13	.77	genius
7.60	.85	exteroceptor	7.13	.83	Müller-Lyer illusion
7.60	.82	irritability	7.13	.82	orientation
7.60	.85	organic needs	7.13	.80	span of apprehension
7.60	.90	thyroid glands	7.13	.85	validity
7.53	.64	accommodation	7.07	.95	association
7.53	.72	achromatic	7.07	.90	binaural
7.53	.73	adrenals	7.07	.80	choroid
7.53	.74	aphasia	7.07	.72	color mixer
7.53	.96	audition	7.07	.62	defense mechanism
7.53	.86	end brush	7.07	.87	fluctuation of attention
7.53	.75	genetic psychology	7.07	.89	pupillary reflex
7.53	.90	just-noticeable diff.	7.07	.91	visual sensation
7.53	.75	mental set	7.00	.88	ciliary muscle
7.53	.79	mode	7.00	.57	empathy
7.53	.67	overt activity	7.00	.92	fixation
7.53	.94	quartile	7.00	.80	incidental learning
7.47	.75	astigmatism	7.00	.94	prenatal
7.47	.80	feeblemindedness	7.00	.95	subliminal
7.47	.96	nerve ending	6.93	.76	fissure
7.47	.75	synesthesia	6.93	.67	inferiority complex
7.40	.77	abnormal	6.93	1.09	physiological limit
7.40	.71	adequate stimulus	6.93	1.00	set
7.40	.85	adjustment	6.87	.85	euphoria
7.40	.81	cold spot	6.87	.73	senility
7.40	.66	dementia	6.87	.91	vasomotor
7.40	.75	distraction	6.87	.93	warm spot
7.40	1.04	imbecile	6.80	.75	dementia præcox
7.40	.87	myopia	6.80	1.00	idiot
7.40	.82	perseveration	6.80	.90	motor area
7.40	.92	reproduction	6.80	.98	negative adaptation
7.33	.74	anesthesia	6.80	.75	nerve center
7.33	.91	criteria	6.80	.94	traits
7.33	.76	inhibition	6.73	.89	affection
7.33	.95	memorizing	6.73	.96	all-or-none theory
7.33	.85	moron	6.73	.62	auditory area

TABLE IV—*Continued*

Mean	σM	Term
6.73	.90	auditory sensation
6.73	1.03	conductor
6.73	.95	corpus callosum
6.73	.97	hunger
6.73	.79	insight
6.73	.93	interest
6.73	.92	maturation
6.73	.97	monocular
6.73	.99	unpleasantness
6.67	.82	case history
6.67	.72	complex
6.67	.83	erotic
6.67	.90	grey matter
6.67	.89	lens
6.67	.90	patellar reflex
6.67	.91	plethysmograph
6.67	.86	suggestion
6.60	.83	antagonistic
6.60	.91	apraxia
6.60	1.03	hyperopia
6.60	.89	impulse
6.60	.91	iris
6.60	.86	knee jerk
6.60	1.04	motor activity
6.60	.88	questionnaire method
6.60	.81	temperament
6.60	.94	tympanic membrane
6.53	1.00	chromosome
6.53	.86	compensation
6.53	.97	distance receptor
6.53	1.09	interoceptor
6.53	1.02	nucleus
6.53	.80	somesthetic area
6.47	.66	adolescence
6.47	.90	disintegration
6.47	.97	instinct
6.47	.95	melancholia
6.47	.70	mnemonic
6.47	.81	secondary personality
6.40	1.03	awareness
6.33	1.00	hypochondria
6.33	1.00	objective
6.33	1.40	psychogalvanic reflex
6.33	.97	schizoid
6.27	.95	atrophy
6.27	.74	autosuggestion
6.27	.92	catatonia
6.27	1.19	gene
6.20	.96	dominance
6.20	1.07	pituitary glands
6.13	1.03	delirium
6.13	1.13	native
6.07	.92	colored hearing
6.07	.82	imitation
6.07	.88	locomotor ataxia
6.07	.86	olfactory area
6.00	1.18	ability
6.00	1.25	anger
6.00	1.00	ataxia
6.00	1.34	capacity
6.00	1.00	feeling
6.00	1.05	gonads
6.00	.85	ossicles
6.00	.99	sadism
5.93	.93	action pattern
5.93	1.05	chronological
5.93	1.09	emmetropic
5.87	1.07	class interval
5.87	1.08	dispersion
5.87	1.12	endolymph
5.87	.99	equilibrium
5.87	1.08	parathyroids
5.87	.98	sibling
5.87	1.05	twilight vision
5.80	.97	Babinsky reflex
5.80	1.05	handedness
5.80	1.20	insanity
5.73	.96	abulia
5.73	1.05	activity
5.73	.83	introversion
5.73	.90	partial recall
5.73	.89	suppressed motive
5.73	1.10	unlearned activity
5.67	.95	border-line condition
5.67	1.13	insulin
5.67	.92	involuntary movement
5.67	.82	unintentional learning
5.60	.93	army tests
5.60	.97	cue
5.60	1.04	heterogeneous
5.60	1.04	homogeneous
5.60	1.05	sustained attention
5.53	.80	autistic thinking
5.53	.95	color-tone series
5.53	1.03	diagnosis
5.53	.96	hedonic
5.53	1.14	plasticity
5.53	1.07	range
5.53	.89	revery
5.47	.87	introvert
5.40	.92	extroversion
5.40	.91	libido
5.40	1.07	myelination
5.40	1.40	percentile
5.40	.81	rapport
5.40	.98	selected population
5.40	1.51	temperature sense
5.40	1.03	tic
5.33	.95	counter suggestion
5.33	1.00	cycloid
5.33	1.01	inattention
5.33	1.34	native characteristic
5.33	1.02	subjective
5.33	1.03	transference
5.33	.97	volitional action
5.27	1.08	corrected score
5.27	1.02	depression
5.20	.95	agraphia

TABLE IV—*Continued*

Mean	σM	Term	Mean	σM	Term
5.13	.87	agoraphobia	4.40	1.17	quartile deviation
5.13	.90	synthesis	4.33	.89	ambivert
5.13	1.13	ventral	4.27	.96	aromatic
5.07	1.01	hyperkinetic	4.27	1.30	automatic response
5.07	1.02	mongolianism	4.27	1.56	hybrid
5.07	.98	near-sighted	4.27	.95	pyromania
5.00	1.37	coördination	4.13	.97	ageusia
5.00	1.28	distance perception	4.13	1.04	pseudophone
5.00	1.13	sublimation	4.07	1.02	curiosity
5.00	1.15	unselected population	4.00	1.05	acquisition
4.93	1.04	agnosia	4.00	1.10	ennui
4.93	.93	alexia	3.87	1.01	acromegaly
4.93	1.14	auditory reception	3.67	.92	interbrain
4.93	1.47	neural correlation	3.47	1.44	complex behavior
4.93	1.06	eidetiker	3.47	.99	egocentric concept
4.93	1.00	infantilism	3.33	1.07	chemique
4.87	.80	acquired character	3.33	1.00	educational quotient
4.87	1.20	subconscious	3.07	1.34	giant pyramids
4.87	1.20	syllogism	2.67	.75	class index
4.60	.95	attainment	2.67	1.09	grouping unit
4.60	1.03	egocentric response	2.53	.98	monstrosity
4.60	1.24	indices	2.53	.95	neonate
4.60	1.00	maniac	2.53	.91	psychological limit
4.53	1.00	acquired difference	2.53	.89	vacillation
4.53	1.00	animism	2.47	.98	class limit
4.53	1.02	anorexia	1.93	.87	absentminded
4.53	1.12	differential	1.93	1.42	associating cells
4.53	.90	gregarious	1.60	.78	apex of the brain
4.47	1.12	inherent	1.33	.76	tubular vision
4.47	1.47	motility	.27	.55	perceptor
4.40	1.04	illiterate			

standard deviation of the ratings for each of the 403 terms is — .658. This is a somewhat questionable descriptive procedure since the data are not strictly linear.

Is psychology employing too extensive a vocabulary for its limited factual data? Do many words and ill-defined usages obscure a dearth of ideas? These and many other related questions might reasonably result from a study such as the present one. Both would very likely be answered in the affirmative by Professors Book and English, and Professor Boring's observations (already quoted) imply something of the same idea. Professor English has stated in conversation with the writer that psychology might be translated into two-syllable words, and with distinct advantage to the student. He writes (June 30, 1931):

> I think as a rough estimate, which is an estimate and not a guess, that 250 to 300 terms will be the absolute outside of terms

which I should wish the student to be familiar with in connection with a course in educational psychology.

Professor Book, writing of this same problem says (Oct. 27, 1931):

> There are a good many terms that, it seems to me, we could get along just as well without and some that were useful in certain senses but that really need not be used. . . . I might make this general observation in regard to the invention and use of terms in other senses than along the line of their historical usage. It simply shows a lack of training in the individuals who invent and use such terms, and I have very little sympathy with anyone who thinks he can gain a reputation or advertise himself by using some new term for data or phenomena that historically have been called by other names, in some cases for centuries.

There also arises the question as to whether the teaching materials now available for the beginning course treat adequately terms of unquestioned value to the field without undue emphasis upon those of little or of questionable worth. As a rough estimate of this, the number of pages devoted to each of the 403 terms in each of the 10 books listed in Table I was determined. While there is a general tendency in all of the books to devote most space, on the whole, to terms rated highest by the judges, and to devote little to those rated low in value, the deviations from this practice are very marked. The product-moment correlation between the mean values of the terms and the total number of pages devoted to them in the ten books is .056 $\pm$ .03. Detailed analysis of the number of pages devoted to each term by each author is not presented here because of two reasons: first, the number of pages devoted to a term is by no means a satisfactory measure of the adequacy of the author's treatment of that term. Such a determination requires careful, detailed analysis of the individual book and, possibly, experimental determination of the effectiveness with which the book conveys an understanding of that term to the student. And second, an inadequate analysis of this type would certainly be interpreted in a

manner inimical to certain of these books and to their authors.

One cannot but be impressed, however, with inexcusable, or seemingly so, gaps in certain, if not in all of the books examined with respect to their treatment of some terms. 'Coefficient of correlation,' ranking third of the 403 terms in mean value, is allowed 18 pages in the ten books, receives no treatment in several, and has little more space accorded it than is given 'automatic response' which ranks fourth from the bottom in mean value. Such inconsistencies of treatment, and these are not isolated cases, cannot but give distorted ideas to the parasitic psychology teacher described in the opening paragraph of this paper.

[MS. received August 6, 1932]

DISCUSSION

CONCERNING THE ANTHROPOCENTRISM OF PSYCHOLOGY[1]

From its beginnings psychology has been anthropocentric. Man has supplied its principal materials and has served also as its standard of reference and comparison. Perhaps it is desirable that this should continue and that anthropocentrism and its competitor for support, biocentrism, should be encouraged, each for its peculiar values.

It appears that the science is now in a period of storm and stress, of uncertainty and confusion. It is striving to be all things to all men. In popular usage the term psychology has become so inclusive and vague as to be worse than valueless, and in the mouths of professionals its meaning depends largely on the interests, assumptions, and prejudices of the individual. There is much talk of Freudianism, Gestaltism, Behaviorism, to mention only a few of the current movements, schools, or methodologies. Each of these tends to be accepted as a psychology and to be mistaken by the layman for the science itself instead of an aspect or point of view. Yet even within the professional group one hears of the 'psychologies of 1930.' Where obviously there should be substantial agreement on certain fundamentals of scientific objective, scope, and methodology, there is intellectual, and too often also emotional, conflict; where unanimity of opinion and coöperation are indispensable to progress, there is diversity of view, antagonism, and destructiveness. As is true in religion, sects and cults obscure essentials. Undoubtedly systems, and even schools, may have value, but there are times when one feels that any person who creates a system of psychology should immediately be buried with it.

Our textbooks of psychology, so called, are amazing conglomerates of factual and other materials gathered from anthropocentric psychology, from neurology, physiology, general biology, genetics, biometrics, eugenics, sociology, and psychiatry. The typical course of instruction for beginning students follows the pattern of such a text. Small wonder then that the intelligent and vigorously critical

[1] This is the substance of a paper presented before the American Psychological Association, Ithaca meetings, September, 1932.

student experiences keen dissatisfaction and commonly turns to other fields of endeavor, while the others muddle through without gaining any clear conception of psychology as science. Is this situation profitable? Is it defensible? Is it even excusable, when obviously there well might be a definite and basic discipline called psychology?

In our day and in the New World it is increasingly apparent that the current of interest is flowing steadily from anthropocentric introspective psychology toward biology. Of one hundred and eighteen titles in the program of these meetings, at least sixty may be classified as psychobiological. Almost unconsciously, and usually without change of name, psychologists are becoming physiologists. The probable outcome of this movement is the disappearance of psychology as science of experience and its assimilation first by psychobiology and ultimately by physiology. It is pertinent to inquire whether this is something to be desired and striven for at the present stage of the development of knowledge, or whether instead effort should be made to guarantee and justify the continuance of anthropocentric psychology.

Clearly a practical situation confronts us, response to which we cannot avoid. Either we may affirm the possibility of serviceable knowledge of the self as conscious object, or we may deny it. In the first instance we naturally should resolve to continue to cultivate what stands historically as the science of psychology, and in the second, we should sanction and further its assimilation by the general science of biology. The latter is precisely what certain American behaviorists are doing.

As it happens, the writer is not in doubt about the desirability of perpetuating and developing to the utmost psychology as historically conceived. With intent to simplify and clarify a situation which is puzzling, confusing, and discouraging alike to laymen and to professional psychologists, and above all to promote constructivity, it is proposed that we agree to recognize and appropriately designate two fields of interest and activity within psychology, as commonly understood. The first, psychology properly so called, is the systematic study of the self and of relations of selves by introspection and any other fruitful methods, and the second, psychobiology, is the objective study of the behavior of the organism (any organism), whether or not conscious or self-conscious, and of its relations to its environment. As thus defined, psychology obviously would be anthropocentric, subjective, logically inclusive of episte-

mology, and allied to the social and philosophical disciplines; whereas psychobiology, by contrast, would be biocentric, objective, one among the biological sciences. Accordingly man may be studied both psychologically and psychobiologically, while all other organisms are primarily materials for psychobiological inquiry.

This proposal seems almost too simple and naïve to be taken seriously; yet things that work, and often truth itself, are like that! The suggestion is wholly pragmatic; adequate logical basis is not claimed for it. But it may not be denied that it finds a measure of justification in current specialization and trends of activity, for most of us who are classified as psychologists are interested primarily either in experience (the conscious self) or in behavior as organic function. Those who are doubtful whether they should be called psychologist or psychobiologist may happen to be both, but more likely they are neither.

Recognition of two natural fields of interest may functionally differentiate them in a profitable way without actually divorcing them as disciplines. Thus also attention may be focused on the distinguishing characteristics of self-study versus behavior-study, and each field of interest helped to achieve larger independence and freedom of development. In the opinion of the writer, neither should be exalted in value above the other or disproportionately emphasized in efforts to advance knowledge; and for both psychology and psychobiology effort should be made to substitute affirmations and complete freedom of inquiry for the negations and limitations which have characterized behaviorism.

Psychology, as herein defined, has as its object the most fascinating but also the most complex and perplexing thing on earth—the human self. Study of the self is as much more difficult and discouraging as it is more interesting and potentially significant to mankind than are the objects of the physical sciences. Although never a psychologist myself, save by reason of the unprofitable identification or confusion of psychobiology with it, for the greater part of my professional life I have consistently supported psychology as study of the self, and I am today even more thoroughly convinced than at any previous time that to neglect or to abandon the systematic introspective and otherwise profitable investigation of mind is almost certain to be seriously detrimental to the development of man's knowledge and understanding of himself, to the profitable evolution of scientific disciplines, and consequently, to the progress of civilization.

For the psychologist, faith and optimism are in point, since what today seems unobservable, unanalyzable, or unmeasurable, may tomorrow yield to newly invented modes of attack, directed by new insights, and furthered by new techniques. The least that might be expected of us, if we are really and whole-heartedly psychologists, is that we continue to carry on optimistically and determinedly, with maximal originality, constructivity, and independence. Loss of faith in psychology as science, because of its slow, halting, or uncertain progress, is unjustified and unreasonable, and to abandon the systematic study of mind and consciousness in favor of the study of the body, its environmental relations and expressions, is to choose what promises to be a relatively open and easy road to success in preference to the difficult. It is very like abandoning the farm or workshop for the gold rush.

Despite the example of my illustrious and immortal colleague William James, who, starting as physiologist, became in turn psychologist and philosopher, and in the end disavowed his faith in experimental psychology, I believe in the value of the science and in its future. I believe also that you of the abundant generation, which even now is crowding mine from the stage, will achieve signal successes. Your youthful ardor and self-confidence undoubtedly will be stirred by clamorous demands for assistance from the social and philosophical disciplines. You will be stimulated, impelled, and inspired to seek persistently and optimistically for new insights, the reformulation of old problems, and the intelligent formulation of new ones, for new methodological leads, new techniques, and new experimental aids. You will be more healthfully independent of the physical sciences and their too easily granted supremacy, more largely aided and less constrained by the points of view and methodologies of the biological sciences than we have been. You will be more alive, alert, energetic, resourceful, courageous, daring, and full of faith and confidence in yourselves and in your objectives than your predecessors. May the fruits of your devoted labors in psychology as study of the self enrich mankind and transform his social life even as the onward sweep of the physical sciences is now transforming his physical environment.

ROBERT M. YERKES

YALE UNIVERSITY

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A NEW INTERPRETATION OF THE RORSCHACH TEST

The Rorschach test has had wide application, not only in the fields of abnormal psychology and psychiatry, but also in the fields of the psychology of perception, mental testing, and personality work. The wide use of the test makes an interpretation of it a matter of some importance. It is the purpose of this article to give a new interpretation of it, and to bring it in line with recent movements in psychology.

The test is described in Rorschach's book *Psychodiagnostik* (Bern and Leipzig, Bircher, 1921), and in English in an article entitled *The Application of the Interpretation of Form to Psychoanalysis* by Rorschach.[1] Oeser[2] in a very recent article on the Rorschach test also gives a description of its use.

The test consists of a series of ten specially prepared symmetrical figures (like large ink blots) on separate cards, some figures are black and white, some black and white with a mixture of color, and some entirely in color. The subjects give a free interpretation of each of the figures. Color, movement (motion read into the figures), and form responses are evaluated. Other factors are also evaluated, such as the number of responses, the clearness of the form seen which is determined by standardizing the figures on a large number of subjects, and originality of the responses also determined by standardization. Of all these, color, movement, and form are the most significant and the least open to question.

Now let us examine Rorschach's interpretation of his test. He points out that introversion and extraversion are normal tendencies which appear just as all other functions do in a great number of variations. He divides each process into two functions: active and passive introversion, and active and passive extraversion. Active introversion results when a person withdraws voluntarily from his environment, as a poet sometimes does, and is called an 'introversive' tendency in distinction to the fixed form which is pathological. Passive introversion results when there is withdrawal without voluntary effort, as in a catatonic patient. The same is true of extraversion, the passive form being manic insanity, the active form the 'extratensive' tendency.

He now explains that these two tendencies, the introversive and the extratensive, are quite marked in the early life of the child, and the education and discipline given the child will determine their

[1] *J. Nerv. & Ment. Disease*, 1924, 60, 225 and 359.
[2] *Brit. J. Psychol.*, 1932, 22, 287.

development. If the child succeeds in combining the two tendencies, the result is merely the concentration of the child's energy on its school tasks, which ends in mediocrity. Reading and other forms of education develop disciplined form-thinking and combat the introversive tendency on the one hand, and the superficial and flighty extratensive tendency on the other. The stronger both tendencies are, the more they resist being combined. Lack of discipline then will allow either the introversive tendency to take the upper hand and bring about the picture of introversion, or will allow the extratensive tendency to get the upper hand, depending on the constitutional nature of the child.

From this it is seen that Rorschach explains the results of his test on the basis of education and training. The development of form and kinæsthetic perception in distinction to color perception, or merely to form perception, results from the training and education given the child. The test determines how far this training has gone, which is shown by the ratio between the number of form and kinæsthetic responses and the number of color responses.

It is evident that this explanation places too much emphasis on the environment. Since some people seem to remain extraverts in spite of training, we must seek another explanation.

Within recent years *Gestalt* psychology has pointed out that the development of the nervous system does not take place in the traditional order. The idea that behavior is a differentiation process of the nervous system in distinction to the idea of a structure built up from elements is slowly gaining ground. In Germany Jaensch and the Marburg Institute are developing this idea in respect to the development of perceptions and images. This school [3] states that images and perceptions are first united and later differentiate. This psychophysical union shows all degrees of integration to complete disintegration. Eidetic images are one form of the union.

The whole individual differentiates, nervous system, perceptions, and the body in general. The original state is an undifferentiated condition of all these processes, and the rate of differentiation will vary with the individual. The perceptions follow this rule closely. The child first sees an undifferentiated world, and the union of images and perceptions creates confusion which may be observed in the young child. It later begins to differentiate objects as wholes. Colors are seen but are not differentiated until later. Children first enumerate the objects they see, then there appears a tendency to

[3] See E. Jaensch, Eidetic imagery, New York, 1930.

see parts and finer detail. The final stage occurs when the individual has differentiated his perceptual processes to such an extent that there is no longer a union between perceptions and images. This sharp separation of perceptions and images gives the inner life of the introvert, since he has broken with his external world by the complete separation of the two processes. The extravert is less differentiated, and there may be some remnant of the original union, which is shown by the prevalence of eidetic phenomena in this type. This gives a closer contact with the environment, since there is a higher psychophysical integration of the perceptual processes.

Now why is it that some individuals in the Rorschach test see color, others see movement? Those who see color are more in contact with the environment, their perceptual processes have not developed as far, and the psychophysical integration gives them the more primitive and objective form of reaction. They are the extraverts. When the number of kinæsthetic responses begins to increase, the psychophysical integration is beginning to break up, and in the final stage the division between perceptions and images breaks the original coherence with the outer world. For these persons a stimulus presents more than what they see, their inner life or images become active and the activity is projected into the thing seen. The extravert does not project his inner life, simply because he does not have it. The introvert gives few color responses because the objective color no longer attracts him, indeed, it repels him, as is often shown during the test by exclamations of dislike. The extravert, on the other hand, revels in colors.

We see, therefore, that the Rorschach test shows the degree of integration of the perceptual processes, not the kind of training, as assumed by Rorschach. Training may hasten or retard differentiation, but is not the direct cause of it. The test is, accordingly, in the final analysis a means of determining the degree of differentiation of the perceptual processes.

HERBERT SHUEY

UNIVERSITY OF KANSAS

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DENNIS ON MASS ACTIVITY: A REPLY

Dennis (5) has questioned the proposition that behavior differentiates from a primitive matrix of mass activity toward specialization of behavior. As evidence against this view, he points out that the first movement of the human fetus has never been observed.

It is true that the first movement of the human fetus still remains to be seen; however, Coghill (2) described the first movement of the Amblystoma larval as being a flexure or bending of the anterior part which soon includes the entire organism. From this primitive pattern he traced the differentiation of subsequent behavior. Tracy (13) found that the first total or mass pattern in the toadfish was the same as the first movement in the Amblystoma. Swenson (12) saw this first movement in the rat fetus. White (14) reported it in the brook trout, and Preyer (11) saw it in the guinea pig long ago. Among the recent observations of this primitive fetal movement is that by Windle (15) and Coronios (4) in the cat, Kuo (9) in the chick, and Angulo y González (1) in the rat. The fact that the same pattern is found in the first observed movement of fetuses throughout the vertebrate series, *i.e.*, amphibia, fish, birds, and mammals, renders its presence in the fetus of the highest mammal, man, at least probable.

Dennis suggests that Coghill's (3) usual statement that behavior develops from a perfectly integrated total pattern through expansion and individuation is 'merely a generalized statement of process with no implication that there is only one response from which behavior develops' (5, page 594). I am not authorized to speak for Coghill but a quotation from him may settle the matter. "I am convinced, by a study of all available records of movement in human fetuses of the first six months, that behavior develops in man as it does in Amblystoma by the expansion of a total pattern that is integrated as a whole *from the beginning*[1] and by individuation of partial patterns (reflexes) within the unitary whole" (3, page 1009).

Dennis is inclined to think that 'reactions of extracted fetuses undergoing asphyxiation may be very unlike those of fetuses in position' (5, page 594). The matter is readily cleared up by reference to the first movements of oviparous organisms such as fish, amphibia, and birds, and viviparous organisms such as rats, cats, and guinea pigs. The first movements of both groups are similar, although the asphyxiation factor is not present in oviparous animals.

Dennis says, "Irwin's conception has the tremendous difficulty of not showing how reflexes can be individuated from a total response in which they never appear to be contained. . . ." (page 595). He asks how smiling, crying, and later responses can develop from that origin. What does being 'contained in' mean? If Dennis means that a later discrete pattern is observable as a part of the primitive mass pattern, the answer is that it is not. This conception

[1] The italics are by the present writer.

on the behavior side is similar to the 'little man in the egg' conception of the early biologists, and indicates a fundamental misunderstanding of the processes of differentiation. His view assumes that specialized reactions somehow are contained in the primitive mass pattern and that differentiation is a breaking down of this pattern *directly* into specific patterns. Such, of course, is not the case.

Development both of structures and behavior is a process characterized by stages, each one more specialized than the preceding stages. Each stage advances the specificity. Each structure emerges from a more generalized structure, and each behavior pattern emerges from a more massive pattern. A few illustrations will make this plain. The embryologist is able to trace the development of muscle, nerve, and bone from the primitive generalized cell layers of the gastrula. But muscle, bone, and nerve are not 'contained in' these layers. Nor does the next stage of differentiation of the ectoderm result in a full-blown nervous system in all its complexity and specificity. Rather, the next stage is a medullary plate. This stage is followed by the neural tube which then begins to show the primitive divisions of the nervous system—the mesencephalon, diencephalon, and telencephalon. These divisions, then, differentiate into their specialized structures. The mesencephalon becomes the medulla oblongata and cerebellum, the diencephalon becomes the thalami, and the telencephalon the corpus striata and the cortex. By gradually increasing degrees of specificity, which follow many lines of increasing specialization of structures, the adult nervous system is differentiated. But this tremendously complex structural system was not contained in the primitive ectodermal layer of cells.

Behavior, too, differentiates in this manner. Coghill (3), Kuo (9), Angulo y González (1), and Irwin (8) have shown that the differentiation of limb activity for different animal forms starts proximally and proceeds distally by stages which first are massive but which finally are specific. Similarly smiling, crying, and the vast number of later patterns are not contained in the earliest pattern but appear along the course of behavior differentiation.

This being the case a sampling of human fetal activity at any given moment during the nine month period would show differentiation at various stages. Some patterns will be revealed in this cross-section as more advanced toward specificity than others. At birth another cross-section sampling will be in evidence as suggested by Dennis's forthcoming report (6). Samplings at month or year

intervals following birth will reveal differentiation advanced in the direction of greater and greater specificity.

Dennis seems to object to the term 'mass activity' on the ground that it is an unusual, 'high sounding designation' (5, page 593). The reply, of course, is that every science is replete with hundreds of high sounding terms which have been given a specialized meaning such as rhinencephalon, autolysis, polysaccharides, product-moment, decibel, compared to which in the mind of the layman the term 'mass activity' is crystal clear. Moreover, the term is a slight modification of another term in good standing among neurologists, namely, the mass reflex of Riddock (7). Dennis would substitute the term 'restlessness' for it, but in physiology restlessness and massiveness of response have different meanings.

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Orvis C. Irwin

Iowa Child Welfare Research Station

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